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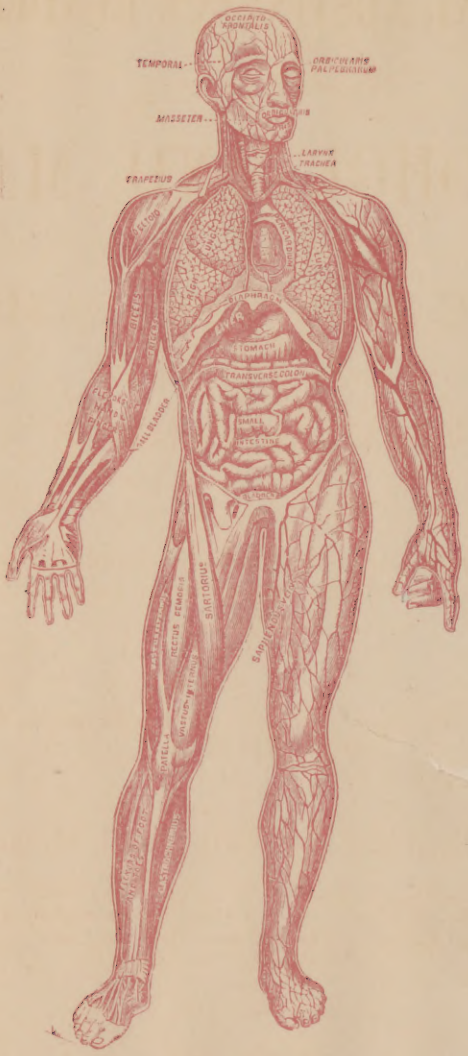

ALCOHOL AND MAN.

THE

TOTAL ABSTINENCE READER.

ALCOHOL AND MAN,

—OR—

THE SCIENTIFIC BASIS

—OF—

TOTAL ABSTINENCE.

A SERIES OF SHORT LESSONS DESIGNED TO TEACH THE CHEMICAL ORIGIN, PROPERTIES, AND PHYSIOLOGICAL ACTION OF ALCOHOLIC LIQUORS.

Prepared for the use of Temperance Organizations, Families, Schools and Colleges,

BY

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Author of "Our Wasted Resources"; the $500 Prize Essay, "Alcohol—What it is, and What it Does"; "Malt Liquors—Their Nature and Effects"; "Hard Times—The Chief Cause—The Remedy," etc., etc.

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ROBERT E. LYNCH, PRINTER,
Howard and Diamond Streets, Philadelphia.

PREFACE.

It is not without hesitancy that The Total Abstinence Reader—Alcohol and Man is added to the temperance literature of the period. But we believe it will supply a want, that has doubtlessly been felt by every active worker in the cause of Total Abstinence, viz: A simply written and concise treatise on the Chemical Nature and Physiological Action of Alcohol, that will embody the less obvious, as well as the more generally known effects of intoxicating drinks.

More than fifty years have passed since the composition of alcohol, and its effects upon the human body have claimed and attracted the attention of Chemists, Physiologists, and Philanthropists. During these years, numerous investigations and observations have been made; and many important works have been written upon this subject by scientists, whose names are ranked among the highest in the annals of chemistry and physiology, on this, and especially on the other side of the Atlantic.

We have not aimed to give a *resume* of all that has been written on the subject, but to briefly give the last *verdict* of *science.*

Every one long connected with the Sons of Temperance, Temple of Honor, Good Templars, or other Temperance Order, has felt the need of some systematic means of instruction for the membership of these Orders, in addition to the knowledge contained in their several Rituals, etc.; for however excellent, instructive and impressive, they are of necessity brief. In the preparation of this exposition of the nature of Intoxicating Drinks and Scientific Basis of Total Abstinence, we have endeavored to supply this necessity both by the matter and arrangement. In its arrangement we have aimed:

1st. That each lesson as far as practical should be devoted to one particular topic, or phase of the Alcoholic

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Controversy, which should not occupy more than ten or fifteen minutes time in its reading; in order that the work could be used as a class book in Divisions, Lodges, etc., in the "Good of the Order"; when one lesson could be read at each meeting by some good reader, previously appointed, the reading commencing with the first lesson, and continued, until the whole of the book has been read. By pursuing this course, the membership would be in possession of an amount of knowledge of their own organism; and their relation to the world around them; with such clear views of the principles of the cause and the order, that they would not only be more zealous, but more effective workers for the cause and humanity.

2d. That the simplicity, conciseness, arrangement and illustrations of the work would adapt it for use as a class book in our public schools, seminaries, and other educational institutions; either alone or in connection with other school books on Anatomy and Physiology. Should it meet with favor as a school book, large diagrams, charts, etc., will be prepared to illustrate the text to classes and public lectures.

While simplicity of language has been used, an argumentative style has been adopted, in order to appeal more forceably to the reasoning faculties, and to expose more clearly the many errors that have for ages clustered around alcoholic drinks, in relation to their many assumed virtues; and also to make a more lasting impression upon the minds of those, who may deem the book worthy of a perusal.

Should this work be the means of diffusing more deffinite knowledge, and clearer views of the *chemical nature* and physiological action of Alcohol on the Human System and the Scientific Basis of Total Abstinence; the time, thought and labor devoted to its preparation, will not have been spent in vain by THE AUTHOR.

Philadelphia, Pa., February, 1881.
2725 North Front Street.

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CHART OF CHEMICAL ELEMENTS.

All substances known to chemists are made up of not less than sixty-six primary elements. Animal and vegetable substances are composed of carbon, hydrogen, oxygen and nitrogen, with very small quantities of sulphur, phosphorous, iron, chlorine, etc.

INORGANIC MATTER.

CARBON=C*

Carbonic Acid.

OXYGEN=O*

HYDROGEN=H*

Water.

NITROGEN=N*

Ammonia.

ORGANIZED COMPOUNDS.

NON-NITROGENIZED ALIMENTS.

Cane Sugar.

Starch.

Grape sugar.

Malic Acid.

Citric Acid.

Stearic Acid.

Margeric Acid.

Albuminoids, or Nitrogenized Aliments.

Albumen, casein, gluten, fibrine, etc,, are the true builders of the tissues of the animal body.

*Symbols of Carbon, C; hydrogen, H; Oxygen O; nitrogen, N.

PUTRIFACTIVE DECOMPOSITION.

Organic matter is transient in its nature, and by decomposition returns to the inorganic form of carbonic acid, water, and ammonia.

Grape sugar under the influence of a ferment is decomposed, and its elements, $C_6H_{12}O_6$, arrange themselves in other forms. Thus, if grape sugar be dissolved in water, and yeast added, it is split up, when the elements re-unite and form two molecules of carbonic acid, each composed of CO_2, or written thus:

COO } Carbonic Acid.
COO } Carbonic Acid.

And two molecules of alcohol, each composed of C_2H_6O, or written thus:

C HHH O
C HHH } *Alcohol.*

C HHH O
C HHH } *Alcohol.*

Alcohol oxydized may result in two atoms of hydrogen uniting with oxygen to form water only, which leaves a fluid called Aldehyde, composed of C_2H_4O, or written thus:

C HH O
C HH } *Aldehyde.*

Oxydation carried further and one atom of oxygen added, the resulting compound will be Acetic acid, composed of $C_2H_4O_2$, or writen thus:

C HH O
C HH O } *Acetic Acid.*

If alcohol is burned in a lamp, the carbon, which in the preceding cases was not touched, is now directly oxydized with the hydrogen, and the result will be the formation of two molecules of carbonic acid, each composed of CO_2, or written thus: COO *Carbonic Acid;* and three molecules of water, each composed of H_2O, or written thus: HHO *water.*

THE

TOTAL ABSTINENCE READER.

ALCOHOL AND MAN.

CHAPTER I.

CHEMISTRY OF ALCOHOL.

LESSON FIRST.

CHEMICAL ELEMENTS AND NON-NITROGENOUS ALIMENTARY PRINCIPLES.

1. To clearly understand the subjects to be discussed in this work, we must have some knowledge of our relation to the material world. Science can only give us this information. What does science teach? Chemistry tells our place among the elements; Anatomy, of our structure and organs; Physiology, the functions of our organs and the laws of life.

2. Chemistry teaches that all the animals, plants, minerals, and everything in the universe are compounded of sixty-six primary substances, called chemical elements

3. Though sixty-six primary elements have been discovered, yet, the air that surrounds the earth, together with all the vegetable forms on its surface, are composed of four of these elements called *carbon*, *hydrogen*, *oxygen* and *nitrogen*. From these four primary elements, the vegetable kingdom derives all its nourishment; and with the addition of very small quantities of iron, phosphorus, chlorine, sulphur, and a few others, they also compose the animal kingdom.

What does Chemistry teach? (2*). How many elements are there? (3). What elements chiefly compose the animal and vegetable kingdoms? (3).

* Figures in parenthesis refer to paragraph.

4. *Carbon*, commonly known as charcoal, is mixed with earthy substances and is solid. Diamonds are carbon in a perfect state of purity. It forms two gases by uniting with oxygen.

5. *Hydrogen* has special affinity or attraction for oxygen, and unites with it to form water. By the exercise of this attraction the decay of all substances depends; and many of the nutritive processes of plants originate in the attempt to gratify this affinity. When in a gaseous form, hydrogen is very combustible and is the lightest body known. It is never found in nature in an uncombined state; water being its most common combination.

6. *Oxygen* is a gaseous element, and forms about one-fifth of the air. It powerfully attracts other elements, and combines with them with such force as to produce combustion. It is greater than all other elements in its range of attractions, and affects the union and disunion of a great number of compounds. It enters the living body and unites with its elements. When isolated or in a gaseous state it has neither taste nor smell, and as it slightly dissolves in water it is found in rain, snow, and water of the running streams. It forms also about one-third of the solid crust of the earth.

7. *Nitrogen* in its chemical character is opposed to carbon and hydrogen, and exhibits an indifference to all other elements and a reluctance to unite with them; and if forced by peculiar circumstances to combine with other substances, it appears inert, so that a very slight change causes a disunion or decomposition. Nitrogen is a constituent of all plants, and during their life is subject to the control of the vital powers; but when life ceases to exercise its powers it resumes its chemical character and causes the decay of vegetable substances by escaping from the compounds of which it was a constituent.

8. Though the elements, carbon, hydrogen, oxygen and nitrogen form organic bodies, yet plants do not make use of them in their simple state, but in the compounds of carbonic acid, ammonia and water. From these compounds all vegetable substances are formed.

9. *Organic Compounds*, whether vegetable or animal,

What is Carbon? (4). What is Hydrogen? (5). What is Oxygen? (6). What is Nitrogen? (7). How do plants use the elements? (8). Describe organic compounds? (9).

have within themselves an organism capable of attracting, appropriating and assimilating other substances to their own use, so that they become a part of themselves.

10. *Inorganic Compounds* are substances without any organism or other means to enable them to appropriate other substances to themselves.

11. All objects on the earth, the atmosphere that surrounds it, and all its inhabitants are forever changing their combinations and forms; yet all these changes are unaccompanied by the loss of a single atom of matter, for the elements on putting off one form ever assume a new one. As already said, all animate and inanimate substances have been reduced by chemists to sixty-six elements or primary substances, though it is possible that some substances now considered as simple elements may be discovered to be compounds.

12. The elements, carbon, hydrogen, oxygen and nitrogen, compose by weight about nineteen-twentieths of the human body, and the plants, and the whole of the atmosphere and the ocean. Oxygen alone composes about one-third of the solid crust of the earth, eight-ninths of all water, and one-fifth of the air.

13. These elements unite to form certain compounds with each other by fixed laws and by different attachments for each other—arranging themselves into different groups by what is called elective or chemical affinity—which chemical union is always in certain definite proportions by weight and in pairs, as sixteen ounces of oxygen and two ounces of hydrogen unite to form eighteen ounces of water (H_2O). If on mixing two elements there are more than enough for one proportion and not enough for two, the surplus will remain uncombined or free.

14. While the elements employed by nature are so simple and so limited, the vegetable products constructed out of them are almost boundless in variety and limitless in number; yet few of them are employed as the general food of man.

15. Chemists represent carbon by the letter C, hydrogen by H, oxygen by O, Nitrogen by N, sulphur by S,

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Describe inorganic compounds? (10). What occurs in all objects on the earth? (11). What chiefly compose all objects? (12). How do elements unite? (13).

phosphorus by P, iron by F, *ferrum*, and chlorine by Chl. Remember these symbols.

16. *Alimentary Substances* are divided into *non-nitrogenized* and *nitrogenized.*

17. *Non-nitrogenized* substances are divided into three groups, differing in the relative proportion of their elementary atoms.

18. *First Group.*—Sugars and allied substances contain six atoms of carbon, or a multiple of that number, with hydrogen and oxygen in the proportion in which they unite to form water, viz: two atoms of hydrogen to one of oxygen (H_2O), and may be divided thus:

I.—Formula $C_{12}H_{22}O_{11}$, or twelve atoms of carbon, twenty-two of hydrogen, and eleven of oxygen.

Cane sugar, or sucrose, from sugar cane.

Milk sugar, or lactose, from milk of mammalia, etc.

II.—Formula $C_6H_{12}O_6$, or six atoms of carbon, twelve of hydrogen, and six of oxygen.

Grape sugar, or dextrose, from grapes.

Fruit sugar, or levulose, from honey and fruits.

III.—Formula $C_6H_{10}O_5$, or carbon six atoms, hydrogen ten, and oxygen five.

Starch in wheat, corn, potatoes, etc., etc.

Dextrine, obtained by heating starch from 150 to 200 F., gums, etc., etc.

19. The grape sugar and starch may be expressed thus:

Carbon,	6 atoms		Carbon,	6 atoms	
Hydrogen,	12 "		Hydrogen	10 "	
Oxygen,	6 "	Grape Sugar.	Oxygen	5 "	Starch.
Total,	24 atoms		Total,	21 atoms	

They are usually expressed thus:

$C_6H_{12}O_6$=Grape sugar, and reads C six, H twelve, and O six, and

$C_6H_{10}O_5$=Starch, and reads C six, H ten, and O five.

20. In both grape sugar and starch the atoms of carbon are the same, and the hydrogen and oxygen atoms are in exact proportion to form water (H_2O), as two atoms of hydrogen and one atom of oxygen form a molecule of water. The same is true of lignums, gums, etc., hence sugars, starches, gums, etc., are simply charcoal and water.

How are alimentary substances divided? (16). Give formula of sugars? (18–19). How are starch and sugars composed?)20).

21. *Second Group of Non-Nitrogenous Substances.*—These are the vegetable acids, malic and citric, which give the sour flavor to fruits, and are differently composed, as seen by the following formula

Malic acid, $C_4H_6O_5$, Citric acid, $C_6H_8O_7$.

In these acids there are variable amounts of carbon with oxygen in excess of the proportion required to form water by uniting with hydrogen.

22. *Third Group of Non-Nitrogenous Substances.*—These are fats and oils, which differ from sugars, starch and fruit acids in having hydrogen and carbon greatly in excess and only little oxygen, as seen by the following formula, thus:

Stearic acid, $C_{18}H_{36}O_2$: margeric acid, $C_{17}H_{34}O_2$.

23. Liebig supposed that the non-nitrogenous alimentary principles were designed chiefly to be burned up in the animal system to produce heat, and were decomposed during the process of respiration into carbonic acid (CO_2), and water (H_2O), and were called elements of respiration.

24. The amount of heat produced by their decomposition will vary with the quantity of carbon and hydrogen contained. Fats, oils, etc., containing the most carbon and hydrogen will give the most heat, next the sugars and starches, while vegetable acids give the least.

25. These substances are so arranged that they meet all the wants of the animal kingdom. The animal oils and blubber are furnished for the inhabitants of the higher latitudes and Polar regions, the fruit acids and starches for the tropics, while these groups are varied and blended between the extremes of heat and cold. Thus the necessities of the whole animal kingdom are met.

LESSON SECOND.

NITROGENOUS ALIMENTARY PRINCIPLES AND LAWS OF FERMENTATION.

26. Having described the first class of alimentary substances or non-nitrogenous principles we will now consider

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How are acids, fats, etc., composed? Give formula? (21–22). What did Liebig suppose? (23–24). How are starch, sugars, etc., distributed? (25). What are the second class of aliments. (26).

the second class of aliments, viz: The *Nitrogenized*, or *True Nutritive Compounds*, which are formed by the addition of nitrogen to the elements composing the *first class*, and are termed *nitrogenized aliments*. They are usually composed of $C_{18}H_{27}N_4O_6$, and are the true builders, being mainly transformed into the animal tissues. While the aliments of the *first class* are not converted into muscle or animal flesh, they may and do undoubtedly produce or generate force.

27. *The Nitrogenous Compounds*, or *Albuminoid Aliments*, though the true builders of animal tissues, have a strong tendency to decompose, or to putrify, and will, under favorable circumstances, make putrid other substances in contact with them.

28. Gases are simple compounds containing a pair of elements with only two, three, or four atoms; but the substances that vegetables form out of them consist of three or four distinct kinds of matter. The greater the number of elements a substance contains the more numerous are its attractions and the easier it decomposes and is broken up by disturbing forces.

29. *The Decomposition of Organized Substances*, or the relapse of their atoms back to inorganic conditions, is regulated by many circumstances, and gives rise to as many substances as the conditions under which decomposition occurs.

30. *Nitrogenous* aliments are the most changable of all organized matter, for, at the common temperature, under the influence of moisture and oxygen, they rapidly putrify. Milk, dough, etc., containing large quantities of nitrogenous matter, rapidly become putrid in the presence of moisture. Nitrogenous matters not only rapidly putrify themselves, but communicate putrifaction to non-nitrogenous substances. Pure starch, sugar, etc., are able to resist putrifaction for an unlimited period; but if brought into contact with a *nitrogenous* substance in the process of decay they become at once affected and go on to the same condition.

31. Vegetables are compounds of carbon with hydrogen and oxygen in the proportion to form water. Thus, a

What tendency have they? (27). What are gases? (28). What occurs when substances decompose? (29). What is a peculiarity of nitrogenized substances? (30).

rotten peach or apple placed in contact with a sound one causes it to rot and its atoms return to their original condition of carbonic acid and water. To place a sound peach in contact with a rotten one is as destructive as to place a firebrand into a pile of wood.

32. *Fermentation* is the term applied to the change that occurs in one organic substance when it is brought into contact and is influenced by another in a state of putrifaction, or in the process of rotting. Starch, sugar and many other substances have no power of themselves to pass into decomposition, or to rot, whilst albumen, fibrin, casein, etc., exposed to moderate heat and moisture, rapidly putrify.

33. Substances that pass spontaneously into a putrid state are called *ferments*. A ferment in contact with sugar causes it to be decomposed, or to be broken up into simpler compounds, and this process constitutes *fermentation*. A ferment is always a substance capable of rotting, or making putrid. Ferments are very widely spread in organic bodies, hence, on the death of an animal or a plant the process of fermentation proceeds more or less rapidly.

34. *Vinous Fermentation* applies to the decomposition of sugars, during the process of which the elements recombine so as to form new compounds, which, under like conditions, are always the same.

35. The conditions consist chiefly in the action of a *ferment* called *yeast* upon a saccharine liquid, when the grape sugar, $C_6H_{12}O_6$, is changed into two molecules of alcohol, each composed of C_2H_6O, (and reads C two, H six, O), and two molecules of carbonic acid, each composed of $C\ O_2$, (and reads C O two).

36. *Yeast*, under the microscope, is seen to be composed of cells or globules—vegetable or animal. When these living organisms are added to a solution of grape sugar, or an infusion of malt, *fermentation begins*, they grow and multiply in warm sugar and water, and go through various changes; the result of their life's action is the conversion of sugar into alcohol and carbonic acid.

37. *Five agents* are needed to produce alcohol, viz: 1, sugar, or a saccharine principle; 2, water; 3, heat; 4, a ferment; and 5, atmospheric air. If either of these agents

What is fermentation? (32). What causes it? (33). Describe vinous fermentation, etc? (34). What is yeast? (36). What are needed to produce alcohol? (37).

is wanting *vinous fermentation* cannot take place and alcohol will not be produced. Vinous fermentation proceeds best at a temperature of from 60° to 80° F.; the desirable mean is 70° F. The process itself generates heat, thus confirming the organic theory. Whatever may be the theory, the results are the same. By the fermentation of sugar *new* substances are produced, by a *new arrangement* of its elements, without the body that excites the fermentation taking any share in the transformation.

38. Sugar, as already said, is the *only* organic proximate principle from which alcohol can be obtained. Sugar contains by weight 42.47 parts of carbon; 50.63 of oxygen; and 6.90 of hydrogen. By exact experiment, 100 parts of cane sugar gave 50.3 to 50.37 parts of carbonic acid, and 52.62 parts of alcohol, or 103.89 parts. The excess found in the alcohol is found as oxygen and hydrogen in the proportion to form water. Therefore, it is certain that in the fermentation of cane sugar the elements of one molecule of water have a share in the transformation.

39 Thus alcohol is formed by the destruction of vegetable principles. Vinous fermentation is the commencement or first stage in the destruction of vegetable principles. Acetous, or acid fermentation, is the second stage in the reduction of vegetables to more simple states. Wine, as it sours, absorbs from the air the oxygen which is necessary to the formation of acetous acid. Finally, after vegetable liquors have passed to the acid state by further exposure to the air, and a warm temperature, putrifaction progresses and terminates in the volatilizing of most of the principles under the form of gas—carbonic acid, carbonated, and even sulphurated, hydrogen gas, ammonia, etc., leaving only mould as the residuum. Thus nature restores to new combinations the materials she had lent to vegetables and animals.

40. *Grape sugar* is the only kind capable of being directly converted into alcohol; the others must be changed into grape sugar before they can undergo *vinous fermentation.*

41. *The cereals*, as rye, wheat, barley, Indian corn, etc., from which alcohol is chiefly produced, contain but little

How much carbon, etc., in sugar? (38). What is alcohol produced from? (39). Which sugar will produce alcohol? (40). How do cereals form alcohol? (41).

sugar, but consists of a great quantity of starch, which is capable of being converted into sugar, by *diastase*, a peculiar principle, which is produced during the germination of all seeds.

42. In malting, the barley and other grains are, first, soaked in water for about forty-eight hours; second, *couching*, when the moist barley is put into heaps, when, after a short time, it becomes warm and begins to sprout or grow; as it grows the *diastase* is formed; to prevent its rotting too much and become entirely destroyed, it is spread out in thin layers on a floor; and that it may not become too hot, it is turned over every day for ten days. During all this time it is sprouting and the *diastase* is changing part of the starch into sugar and a part into *dextrine*, called sometimes British gum. It is then dried in a kiln to stop its further growth, and if it is to be used to make porter, it is slightly burned, so as to make it brown; and lastly, the sprouts are rubbed off when the malt is ready for use. The proportion of *diastase* in malt is not more than one part in five hundred; yet, at the temperature of 150° F., this small amount is sufficient to change two thousand parts of starch into dextrine and then into grape sugar.

43. The *bruised malt* is mixed with ground meal or other grain and water, when the *diastase* of the malt changes the remaining starch into sugar. The *mash*, or sweet liquor, contains the newly formed grape sugar, and by fermentation can be changed into alcohol and carbonic acid.

44. *All fermented liquors* are alcoholic beverages. Ale, beer, etc., are produced by the fermentation of an infusion of barley and sugar, while other grains are sometimes used. Wine is fermented juice of grape; cider, the juice of apples; perry, the juice of pears; palm wine, of the sap of different palms. Fermented liquors, termed wines, are also made from the juices of various fruits with the addition of sugar. Mead is a fermented liquor from honey. From these and all other fermented liquors alcohol can be obtained.

Describe the process of malting, etc. (42–43). Describe the different drinks. (44).

LESSON THIRD.

NATURE AND CHARACTERISTICS OF THE ALCOHOLS.

45. Having seen how alcohol is generally produced, we will now examine its *nature* and its peculiar characteristics. In the first place, let it be distinctly understood, that alcohol, in ale, beer, wine, etc., is only one member of the family of the alcohols, and that they have all a common origin—the fermentation or destruction of organic substances.

46. We have seen that there are sixty-six primary or chemical elements known at present to chemists, and that the four elements, carbon, hydrogen, nitrogen and oxygen, make up, with a little phosphorus, iron, chlorine, etc., nearly all the vegetables and animals on the earth.

47. *An element* is a substance that cannot by any known method be divided, such are carbon, hydrogen, etc., etc.; while a compound is any substance organic or inorganic that is composed of two or more elements, as water, for instance, which, as already seen, is composed of hydrogen and oxygen; and alcohol, of carbon, hydrogen and oxygen.

48. The elements, *carbon* and *hydrogen*, are capable of being burned in the air. Carbon in a separate state is solid, as charcoal, soot and diamonds; while hydrogen in that condition is a gas, and the lightest substance known.

49. In ethylic alcohol these elements are united in the proportion of two atoms of carbon to five of hydrogen. In this state of combination these elements constitute what is termed a *radical*. A radical is a substance that, though composed of two or more elements, acts as if it were itself an element. Ethyl is the name of this radical. In alcohol, this radical, *ethyl*, is combined with the elements that form water, and is called ethylic alcohol, and is formed thus:

50. Water consists of two atoms of hydrogen and one atom of oxygen; both elements exist as gases when in a separate state; but in combination form a fluid. Water

What are alcohols? (45). Name the four principle elements? (46). What is an element? (47) What of carbon and hydrogen? (48). What is a radical? (48). Describe ethyl and water? (50).

is formed of three atomic parts, and the radical ethyl of seven atomic parts, and is expressed thus, H_2O = water, and C_2H_5 = ethyl; but to simplify will write them thus: C C H H H H H = ethyl, + H H O = water.

51. In alcohol one of the atoms of the hydrogen in water is replaced by the radical ethyl. When it consists of two atoms of carbon, six atoms of hydrogen, and one atom of oxygen, and is expressed thus: C_2H_6O, or C C H H H H H H O = Alcohol. Ethylic alcohol is, therefore, in a chemical sense, water in which the organic radical ethyl, composed of two atoms of carbon and five of hydrogen, is added and replaces one atom of the hydrogen of the water, leaving, as already seen, two atoms of carbon, six of hydrogen, and one atom of oxygen.

52. Fermented liquors contain dilute ethylic alcohol and some other substances. Crude spirits are obtained by distillation, which still contain a large proportion of water, with some impurities; one of these is *fusil oil*, which is especially present in spirits obtained from Indian corn and potatoes. To obtain alcohol free from water it must be distilled over again with lime or some other substance having a strong affinity for water. Owing to the strong attraction alcohol has for water it is very difficult to obtain absolute or entirely pure alcohol. When alcohol is mixed with water it evolves heat and contracts, so that 53.7 volumes, and 49.8 volumes of water produce only 100 volumes of dilute alcohol.

53. Ethylic alcohol, when oxydized, yields a variety of compounds according to the character of the oxydation. The result may be the oxydation of two atoms of hydrogen, by which only water is produced, which will leave a fluid with the composition of C_2H_4O—*aldehyde*. If the oxydation is carried still further, and an atom of oxygen be added, the resulting compound will be $C_2H_4O_2$—acetic acid. But should the alcohol be burned in a lamp the carbon, which in the preceding case, was not touched, is now directly oxydized with the hydrogen, when the result will be the formation of dioxide of carbon, carbonic acid, C O_2, and water, H_2O.

54. Ethylic alcohol, or common alcohol is, as already

What is ethylic alcohol? (51). What do fermented liquors contain? (52). What does ethylic alcohol yield on oxidation? (52). Name the radicals alcohols aldehydes and acids in Table I.? (54).

said, only one member of the family of alcohols, which consists of an extensive series of chemical agents, some of which are given in the following table:

TABLE I.

OF RADICALS, ALCOHOLS, ALDEHYDES, AND ACIDS.

Organic Radicals		*Alcohols.*		*Aldehydes.*		*Acids.*	
Methyl,	$C H_3$	Methylic,	$C H_4 O$	Formaldehyde,	$C H_2 O$	Formic,	$C H_2 O_2$
Ethyl,	C_2H_5	Ethylic,	$C_2H_6 O$	Aldehyde,	$C_2H_4 O$	Acetic,	$C_2H_4 O_2$
Propyl,	C_3H_7	Propylic,	$C_3H_8 O$	Propionaldehyde,	$C_3H_6 O$	Proponic,	$C_3H_6 O_2$
Butyl,	C_4H_9	Butylic,	$C_4H_{10}O$	Butylaldehyde,	$C_4H_8 O$	Butyric,	$C_4H_8 O_2$
Amyl,	C_5H_{11}	Amylic,	$C_5H_{12}O$	Valeraldehyde,	$C_5H_{10}O$	Valerianic,	$C_5H_{10}O_2$

By examining Table I it will be seen that all the alcohols have the same plan of construction as ethylic or common alcohol; that is, one atom of the hydrogen of water, H_2O, is replaced by an organic radical. The radical of propylic Alcohol is *propyl*, C_3H_7; in butylic alcohol is *butyle*, C_4H_9, and in amylic alcohol is *amyle*, C_5H_{11}. The change of each is the same. By their oxidation the corresponding aldehydes and acids are obtained, as given in the table.

55. Taking ethylic alcohol as a type of the others in the series, let us study their properties.

56. *Methylic Alcohol*, the first in the series, is produced in the destructive distillation of wood, and is commonly known as *naphtha*, or *wood spirits*. It differs from ethylic alcohol in being a compound in which the radical methyl, CH_3, replaces one atom of hydrogen of the water, thus:

$$\left.\begin{matrix}H\\H\end{matrix}\right\}O \text{ Water}, + CH_3 \text{ Methyl}, - H = C\left.\begin{matrix}H_3\\H\end{matrix}\right\}O \text{ Methylic Alcohol.}$$

57. *Methylic Alcohol* is a composition of CH_4O. When it is slowly oxydized it yields an aldehyde termed formaldehyde, to produce which two atoms of the hydrogen of methylic alcohol are oxydized, forming one equivalent of water$=H_2O$, and formaldehyde, CH_2O, a gas.

TABLE II.

Showing the new names of the organic radicals of alcohols and the new names of the alcohols, with their elementary composition, specific gravity, and boiling point.

Radicals of Alcohols.		*Alcohols.*			
New Name.	*Composition.*	*New Name.*	*Elementary Composition.*	*Specific Gravity, Water—1000.*	*Boiling Point, Fahr.*
Protylen,	CH_3	Protylic,	$CH_3 + HO$	814	140°
Deutylen,	C_2H_5	Deutylic,	$C_2H_5 + HO$	792	172°
Tritylen,	C_3H_7	Tritylic,	$C_3H_7 + HO$	—	205°
Tetrylen,	C_4H_9	Tetrylic,	$C_4H_9 + AO$	803	230°
Pentylen,	C_5H_{11}	Pentylic,	$C_5H_{11} + HO$	811	270°
Hexylen,	C_6H_{13}	Hexylic (old)	$C_6H_{13} + HO$	821	302°
Heptylen,	C_7H_{15}	Œnanthic,	$C_7H_{15} + HO$	—	—
Octylen,	C_8H_{17}	Octylic (old)	$C_8H_{17} + HO$	—	—

The remaining radicals and alcohols of the series are formed on the same progressive plan: increasing in the proportion of one atom of carbon to two atoms of hydrogen. The radical Melyl, is composed of $C_{30}H_{61}$, and Melylic alcohol of $C_{30}H_{61}HO$.

What is methylic alcohol? (56–57). Name the different alcohols on Table II?

58. When the heavier alcohols are burned in a lamp, the oxygen in the air is not enough to consume all the *carbon;* there is, therefore, a large amount of soot deposited. The greater the proportion of carbon and hydrogen an alcohol contains, the greater is its fluid density, its vapor density, and higher its boiling point; and these conditions greatly modify the physiological actions of the different alcohols.

59. *Ethylic Alcohol*, containing two atoms of carbon, six atoms of hydrogen, and one of oxygen, is highly inflammable, producing no soot, and little light, but great heat, and is well adapted to the wants of the chemist to produce heat, and as a solvent of many articles that water will not dissolve; and being a powerful antiseptic it will prevent the putrifaction of animal and vegetable substances when put into it, and is, therefore, useful to physicians and naturalists to preserve dead bodies.

60. *Fermented* and *Distilled Liquors* differ only in degree—the essential ingredient in each is alcohol. Distillation is the process by which water is separated from the alcohol, but the term is often employed to designate malting, mashing, fermenting, and separating the spirit from the water. Alcohol, being a light fluid, is converted into vapor at a heat of forty degrees F. lower than is needed to vaporize water; hence, the heat that would not convert water into steam, raises alcohol into vapor which is passed through the worm of the still surrounded by cold water, when it is condensed into a liquid.

61. Common commercial alcohol contains a variable proportion of water. Rum, whisky and gin, contain, by Brande's analysis, from fifty-three to fifty-seven per cent. of alcohol; port wine, twenty-two; champagne, twelve; cider five to nine, and beer four to six per cent. Dr. Bence Jones' examination agrees in the main with Brande.

62. Prof. John C. Draper, of the University Medical College, New York city, made a chemical examination of the liquors sold at the first-class drinking places of that city, and found the alcoholic percentage of whisky to be from twenty-nine to forty-nine; brandy, twenty-two to fifty-six, and gin, thirty-one.

Name the heavier alcohols, and results when burned. ¶ 58). How do fermented and distilled differ? (60). Give per cent. of alcohol in liquors? (61–62).

63. It may be said that, as a rule, the per cent. of alcohol in spirits, sold at retail, is about forty; wine, twenty; and malt liquors, five. Home-made wines are often stronger of alcohol than imported wines, depending upon the amount of sugar added to the fruit juices. Home-made wines are, therefore, not the innocent, harmless beverages some of our mothers believed, when they earnestly told us there was nothing in them to hurt anyone, as they knew there was nothing in the wine but the juice of the fruit and a few pounds of sugar. They did not know that the sugar was changed to alcohol, and that the more sugar we add to the juice of any fruit the more alcohol will be formed, if allowed to ferment, and more hurtful will be the wine.

64. Alcohol, we have seen, is not limited to one substance, but includes a large number of compounds, having the composition of saturated hydro-carbons, in which one or more of the hydrogen atoms are replaced by *hydroxal*. Thus, the true origin of alcohol is from the destruction of sugar, and has no other source in nature.

65. It is not a product of vegetable growth, like the articles created to nourish man; but is a product of dissolution, the wreck, the disorganization of human food, and really a product of decomposition and death. No chemist has ever found it among the substances formed by plants. Nature, in the laboratory of vegetation, takes the poisonous gases and splits them up, and puts the atoms together in new groups that are able to nourish the system. "Nature," says Count Chaptel, "never forms spirituous liquors; she rots the grape upon the branch, but it is *art* which converts the juice into wine."

66. The juices of the fruits, by the fungus yeast, are turned into rottenness, and then, and not till then, is alcohol, with its twin spirit and destroyer, *carbonic acid*, generated out of the destruction of organic sugar. Alcohol has the same origin as the fatal and malignant exhalation of the pestilence: the death and putrifaction of organic substances; and is in no sense the GIFT OF GOD, any more than is the *malarial poison* that with its poisonous breath strikes down the young and old with *disease* and *death*.

Is alcohol a product of vegetable growth? (63–64–65).

CHAPTER II.

IS ALCOHOL DECOMPOSED IN THE BODY?

LESSON FOURTH.

LIEBIG'S THEORY OF OXIDATION.

67. Having examined the nature and characteristics of the alcohols, we shall now try to ascertain what becomes of ethylic alcohol when taken into the animal system. This, to some extent, is an open question. The points settled are, that alcohol, being absorbed into the blood, is carried to all parts of the system, and that some of it passes out of the body unchanged in all the excretions.

68. Liebig advanced the theory that alcohol, combined with oxygen in the lungs, furnished heat, and passed out of the body in the form of carbonic acid and water. Without proof, this idea generally satisfied the medical profession. It was taken for granted that its highly combustive nature would dispose it, when brought into relation with oxygen in the capillaries of the lungs, to change into carbonic acid and water.

69. A strong argument that alcohol is not used up in the body, like common articles of food and their derivatives, is the fact, that alcohol is eliminated, or carried out of the body with the biliary and urinary secretions, and probably by the pulmonary and cutaneous exhalations, as indicated by the alcoholic odor of the breath and perspiration of persons intoxicated. Indeed, there is no alimentary substance that passes out of the system unchanged, unless the organic functions are deranged.

70. That alcohol is unchanged in the body has many advocates. As early as in 1830, Dr. James Kirk, of Scotland, in an address to the Vale of Leven Temperance Society, stated, that he had dissected a man who died while

What was Liebig's theory and arguments against it? (68-69). What did Dr. Kirk find? (70).

intoxicated. He performed the operation a few hours after death, and that in two cavities of the brain—*the lateral ventricles*—was found the usual quantity of limpid fluid, which had the odor of whisky, and that when a light was applied to a portion in a spoon it actually burned blue, the characteristic flame of the poison.

71. Doubts being expressed as to alcohol being found in the brain, Dr. Ogston, of Aberdeen said, "I am happy to be able to add one case to their number. The body of a woman, aged forty, of the name of Cattie, who was believed to have drowned herself in a state of intoxication, was found August 23, 1831, in the Aberdeen ship canal. I, in company with another medical man, was requested to examine the body, and report the cause of the death. * * * We discovered nearly four ounces of fluid in the ventricles, having all the physical qualities of alcohol, as proved by the united testimony of two other medical men, who saw the body opened and examined the fluid."

72. To test these statements, Dr. Percy, of Nottingham, England, instituted a series of experiments. He introduced alcohol into the stomachs of dogs, sometimes in quantities to produce death, at others, so diluted as only to produce intoxication. It was no difficulty for him to extract alcohol from the blood and the substance of the brain, but he could not detect it in the fluid of the ventricles of the brain. The alcohol obtained from the brain substance was proportionately larger than from any of the other tissues or fluids of the body. Thus a kind of attraction or affinity appears to exist between alcohol and the brain substance.

73. He obtained alcohol from the *liver* and the *bile*, and detected it in the urine of dogs and men. He also showed that alcohol when introduced into the blood caused death by its specific action on the *nerve-centres*, and not by coagulating the blood, as Orfila stated.

74. Strong evidence was presented by these experiments that the effects of alcohol are due to its absorption and conveyance in substance to the organism on which it exerts its influence, unless it is so strong as to produce a *shock* on the *nerve-centres*, similar to a severe blow, or kick in the

What did Dr. Ogston find? (71). What did Dr. Percy find to be the relation of alcohol to the brain, the liver, the bile, &c.(72–73). How does alcohol cause death? (74).

region of the stomach. Dr. Percy's experiments were either not well known or not well appreciated, or Liebig's doctrine of the food value of alcohol could not have been so readily nor so generally received.

75. To solve the question of the combustion or non-combustion of alcohol in the animal body, attempts have been made to discover the derivatives, which have hitherto failed. The first derivative formed by oxidation of alcohol is *aldehyde*—$C_2 H_4 O$ (see Chart II), which is alcohol minus two atoms of hydrogen, which united with oxygen to form water—$H_2 O$. The second result from further oxidation is acetic acid—$C_2 H_4 O_2$—to form which the two atoms of hydrogen removed to form water are replaced by one atom of oxygen. No proof had ever been given that alcohol is decomposed in the body, but many experiments had indicated that it was not: when in 1860, three Frenchmen, MM. Lallemand, Perrin, and Duroy, published their work, "*The Role* (action) *of Alcohol and the Anæsthetics*," showing that:

ALCOHOL IS ELIMINATED FROM THE BODY AS ALCOHOL.

76. The learned Frenchmen, MM. Lallemand, Perrin, and Duroy, had for years been investigating the actions of æther, chloroform, and similar substances, and had invented a method of detecting the presence of chloroform, etc., in the blood and tissues, and had established that this agent, when inhaled, is received in substance in the blood and is carried to the brain, and may be extracted from it after death; and also, that when the inhalation is stopped, chloroform is rapidly eliminated, or carried out of the body with the breath. Alcohol, being related to chloroform, æther, etc., in chemical composition and physiological action, naturally claimed their attention.

77. In their earlier experiments in search for alcohol, they resorted to distillation and condensation, as Dr. Percy had done twenty years before, and very distinctly verified his results. They failed, however, to obtain alcohol by distillation from the vapor breathed by two brandy-drinkers. But, having, by good fortune, accidently attached to the end of their condensing apparatus, a tube, containing a *red* solution of *bi-chromate of potash* and *sul-*

What is aldehyde? (76). Give Lallemand, Perrin, and Duroy's, experiments? (77).

phuric acid, they found that the breath of the brandy-drinkers changed this *red* solution to an *emerald green*. Struck by this discovery, they commenced a new series of experiments. They first proved that the breath of persons not under the influence of alcohol, caused no change in the color of the solution.

78. Their next step was to determine if the derivatives of alcohol —*aldehyde* and *acetic acid*—could be detected after alcohol had been taken; but, excepting slight traces of *acetic acid*, none could be found; yet they had no difficulty in detecting aldehyde, when it had been administered. Thus proving conclusively that alcohol is not changed into *aldehyde* in the body. The slight traces of acetic acid found in the stomach, and in the blood, is no evidence that alcohol is converted into acetic acid in the blood, as traces of acetic acid are found when no alcohol has been taken, as food containing starch or sugar is sometimes converted into acetic acid.

79. MM. Lallemand, Perrin and Duroy, from their experiments, felt justified in concluding that alcohol is not decomposed; but that it is excreted as alcohol. This being true, it has no claims as a food, but must be classed among those medicines and poisons whose presence in the animal body exert a powerful influence, either for good or evil. While the experimenters do not claim to have reproduced the whole of the alcohol introduced into the body, in every instance, they very justly claim that such cannot be fairly expected, or reasonably exacted.

80. While on the one hand, there is entire absence of proof that alcohol is used up in the body by a combustive process, the assumption that it is so used or decomposed is met by the fact that none of its derivatives are detectable in the blood; for, if they were there, their presence could easily be discovered. That alcohol is decomposed is rendered still more improbable by the length of time it remains in the body, even when taken in small quantities.

81. Then again, there *is proof* that it is eliminated, or carried out of the system with the excretions of the lungs, kidneys and skin, unchanged in any of its characteristics as alcohol. It was also found in the substance of the brain,

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Was aldehyde found? (78). Is the presence of acetic acid proof of decomposition? (78) What were the conclusions of Lallemand? (79). Give reasons why alcohol is not decomposed in the body? (80–81).

liver, and the blood, after death, even for a period of thirty-two hours after the liquor had been taken.

82. From these experiments we learn the following, as translated by Dr. F. R. Lees, to which he gives the title of:

ALCOHOLIC ALPHABET.

A. Alcohol injected into the stomach, applied to the skin, or introduced as vapor into the lungs, is absorbed into the veins and carried by the blood into all the tissues.

B. The injection of alcohol produces upon animals an intoxication that is marked by a progressive series of functional disturbances and alterations, the intensity of which corresponds with the quantity of alcohol absorbed.

C. It manifests itself at first by a general excitement, but, by-and-by, the respiration and circulation are relaxed, and the temperature lowered.

D. Muscular power is weakened and extinguished; always beginning at the extremities.

E. The insensibility gradually extends to the centres, (as in dead-drunkenness).

F. The heart is the last to die (ultimum moriens)

G. The time that elapses between the beginning of intoxication and death varies from forty-five minutes to three hours.

H. When the dose is not sufficient to induce death, the excitability of the nervous system returns, *after a time, varying with circumstances.*

I. The arterial blood remains bright and preserves all its apparent qualities nearly up to the moment of death.

J. Alcoholized blood contains during life and after death a great number of free, fatty globules, visible even to the naked eye.

K. The pathological alterations are: Vivid inflammation of the mucous membrane of the stomach, and accumulations of blood in the right chamber of the heart and

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How does alcohol get to the tissues? (A). How does it act when injected? (B). Where is the action first manifested? (C). How dose it effect muscular power? (D). The sensibilities? (E). The heart? (F). What is said of arterial blood? (I). What of alcoholized blood? (J). What alterations are caused? (K).

the large veins, congestion of the mininges, and especially of the lungs.

L. All solids or liquids in union with alcohol are easily separated by distillation, or proportionately by the method of volumes.

M. Alcohol, taken by the stomach, accumulates in the liver and the substance of the brain; if in the blood it be represented as 1.0; in the brain, it is 1.34; in the liver, 1.48.

N. Dilute alcohol produces the same effects when introduced by injection into the veins as when introduced into the stomach, but operates more rapidly. The animal succumbs in less than twenty minutes.

O. Alcohol injected into the veins spreads to all the tissues, but accumulates most largely in the brain: being in the liver, 1.75; in the cerebral matter (or brain substance), 3.

P. Death by alcoholic poisoning is due primarily to its special *action* on the *nerve centres*.

Q. After the injection of a small dose of brandy (25 grammes=360 grains), the blood continues to manifest the presence of alcohol by chemical re-action for many hours.

R. We have never found in either the blood or tissues any of the derivatives of alcohol.

S. Only in the stomach were found traces of acetic acid, generated from alcohol, by the ferment of the gastric juice.

T. Alcohol is rejected from the vital economy by divers systems of elimination by the lungs, the skin and the kidneys.

U. These organs are found to eliminate alcohol after the injection of doses very small.

V. The elimination lasts many hours, even after an ingestion very moderate; the kidneys continue longest to reject.

X. Aldehyde introduced into the stomach is readily found in the blood.

Y. The aldehyde is in great part eliminated; in part transformed into acetic acid.

Z. Alcohol has the same action, and produces the same effects upon men and the lower animals.

What of solids and liquors? (L). What proportion is found in different tissues? (M). How does it cause death? Where the derivatives of alcohol found? (R). Is it retained in the system? (T). What becomes of it? (U.V). What becomes of aldehyde? (X.Y).

83. The conclusions arrived at by these learned Frenchmen, are also translated as follows, and are called:

"THE SEVEN PILLARS OF TEMPERANCE."

"1. Alcohol is not food.

"2. Alcohol is a special modifier of the nervous system. It acts in feeble doses as an excitant; in larger, as a stupefiant.

"3. Alcohol is never transformed—never destroyed in the organism.

"4. Alcohol accumulates by a sort of elective affinity in the brain and in the liver.

"5. Alcohol is eliminated from the organism in totality and in nature. The channels of elimination are the lungs, the skin and the kidneys.

"6. Alcohol has a pathogenetic influence, material and direct, upon the development of many functional disturbances and organic alterations of the brain, liver and kidneys.

"7. Spirituous drinks owe to the alcohol they contain their common properties, and the speciality of their effects. The use of fermented and distilled liquors is often noxious. It should always be restrained; it should never be tolerated, save in exceptional circumstances."

LESSON FIFTH.

THE ALCOHOL IS NOT ALL ELIMINATED.

84. As already shown, there is strong evidence that alcohol undergoes no chemical change in the body, but that it is eliminated by all the excretory organs; and also that while circulating in the blood, through the body, the sensibility of the brain, and the whole nervous system, is diminished as by æther, chloroform, etc., which retards the active normal changes in the tissues; as a consequence, the natural and necessary elimination of the morbid matters is diminished.

What are the pillers of temperance? (1–7). What effect has alcohol on the system? 84).

85. It is therefore certain that the food hypothesis of alcohol is a *myth;* and that the old Liebigian doctrine must give way for the new. But as men differ in their ideas and opinions, it is not surprising that some doctors should be unwilling to unlearn their medical fallacies of alcohol's wonderful strength-giving, force-generating, and tissue-preserving power.

86. If alcohol is food, so is æther and chloroform; the difference in their action being but secondary. Each, as soon as it enters the blood, is treated as an intruder, to be removed from the body as quickly as possible by all the excretory organs.

87. The position of the French experimenters did not pass unchallenged. The chief objection was, that the amount expelled was small compared with the quantity taken. In France, the results commanded general assent, and the learned Trousseau said:

88. "It has been shown by the recent experiments of Maurice, Ludger, Lallemand, and Duroy, that alcohol is not decomposed in traversing the organism, and that it does not resolve itself into secondary products, such as carbonic acid and aldehyde, as formerly believed; but, that during the whole of its sojourn in the tissue, it is alcohol, and as alcohol, acts on them."—(Lectures on Clinical Medicine, 1870.)

89. Differences of opinion prevailed in England. The British Medical Journal owned that alcohol was treated by the system as a convicted venomous intruder. Some disputed the fact; others admitted that while some of the alcohol was excluded from the body, the system used up the greater part; the surplus being only expelled.

90. While medical and other journals were discussing the question, important experiments were instituted, on one side, by Dr. E. Smith, Prof. Parkes, and Count Wollowicz and Dr. Richardson; and on the other, by Drs. Anstie, Thudichum and Dupre.

91. Dr. Subbotin, in 1870, by a variety of experiments, found that much more alcohol was expelled unchanged from the body than had previously been detected; thus

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What is the relation of alcohol to aether? (86). What did Trousseau say? (88). What opinion had English physicians on elimination of alcohol? (89). What did Dr. Subbotin find? (91). What did Prof. Parkes say? (91).

warranting the inference, in the absence of positive evidence, that the human body refuses to convert and use alcohol for its wants, but does its best to expel it; and the portion that remains in the body does not serve a useful purpose, but acts as an implacable foe.

92. If even a portion should linger in the system and undergo conversion (of which there is no positive evidence), "this fact alone," as Prof. Parkes said, "would not guide us to the dietetic value of alcohol, seeing we have first to trace the effects of that destruction, and learn whether it is for good or evil."—(A letter to Dr. Anstie, in the "Practitioner," February, 1872.)

93. It is due to the late Dr. Anstie to state that he defended the administration of alcohol in only small doses, while he condemned its free use as unsafe, and many are his warnings against its use except in very small doses. The whole argument may be briefly stated as follows:

"DR. ANSTIE'S FINAL EXPERIMENTS ON THE ELIMINATION OF ALCOHOL FROM THE BODY."

94. Dr. Anstie said: "No physiologist, of any standing, at the present doubts that the hydro-carbons (fats), and carbo-hydrates, (starch and sugar,) by their consumption produce available force within the body, and in fact the bulk of the work done in the organism. * * * I think I may take it as conceded that quite 600 grains of absolute alcohol can be disposed of daily within the organism of an adult male without any perceptible injurious effect upon the bodily functions. Now this quantity of alcohol is (theoretically) capable of generating an enormous amount of force; but it is certain that *that force does not show itself under the form of heat.*"

94. "It is scarcely possible, therefore, but that the solution of the question as to the action of alcohol in the body will also bring about the discovery of new physiological facts of great interest and importance."

"I. If alcohol be a force-producing food, as seems by far the most likely, it is probably of great value in that capacity, on account of the rapidity with which its transformation

What was Dr. Anstie's opinion? (92). What on hydro-carbons, &c.? (93). How much alcohol can be consumed daily? (94). What of the dose-age of alcohol? (94). What of oxidation of alcohol? (95).

takes place. It is, however, abundantly certain that beyond a certain dosage (which is pretty clearly made out for the average, though there are individual exceptions in both directions), it becomes a narcotic poison of a dangerous character in every respect, not the least disadvantage being that it cannot be eliminated to any considerable extent.

"II. If alcohol does not disappear by oxydation, it must undergo some as yet quite unknown transformation, after which it must escape unrecognized in the secretions. I have heard various attempts to suggest such modes of disappearance, but nothing, so far, which wears any air of probability.

"III. If alcohol, however, be indeed oxydated, and yet does not beget force which can be used in the organism, this would be the strangest possible discovery, considering the very high *theoretical* force value of the 600 to 800 grains of absolute alcohol which millions of sober persons are taking every day, we may well be hopeless of any reasonable answer to the question. Why does not this large development of wholly useless force within the body produce some violent symptoms of disturbance?" Such is the present chemical aspect of the question of the elimination of alcohol from the system. Though there is need for still further research and investigation, it is probable that the greater portion is cast out of the system unchanged.

96. Does alcohol undergo oxydation or does it arrest oxydation? Does it burn in the body and yield the same products as when burned in a lamp—*carbonic acid* and *water*—or does it burn in the body at all? The evidence is conflicting. On one hand, there are the experiments of MM. Lallemand, Perrin and Duroy, and others, showing that alcohol is laid up in the tissues until it is eliminated by the excretory organs: on the other, the experiments of Thudichum, Dupree and Anstie: that when the body was super-saturated with alcohol it passed off free with the urine, yet it bears but a small proportion to what ought to be found, if the whole were eliminated in the form of alcohol.

97. Each and all agree that it passes off in certain stages of intoxication as alcohol, but as the whole is not

In what are all agreed? (97).

accounted for by their experiments, they beg the question by assuming that the remainder is consumed by oxidation, or other process.

98. Before admitting, because only a small portion of that ingested, is collected as alcohol, that the remainder is consumed in the system, we must know how much the body will hold; how much can be held in combination with the water of the tissues, and how long a time must pass before a given quantity of alcohol is actually removed from the tissues.

99. From the well known greed of alcohol for water, a very large quantity ingested will become absorbed with water in the tissues, and remain within the system long after the period when it ceases to be detected in the excretions of the lungs, skin, kidneys, etc.

100. We are unable to conceive of the very "high *theoretical force value of* 600 or 800 *grains* of *absolute alcohol*, that Dr. Anstie said millions of sober persons are taking daily." He asks: "Why does not this large development of wholly useless force within the body produce some violent symptoms of disturbance?"

101. Though unable to see the development of the force named, we have no difficulty in perceiving many violent symptoms of disturbance. These disturbances can be seen everywhere upon the users of alcohol. No one needs to search far to find them, as will be seen further on.

102. Alcohol cannot give force if it does not give heat to the body. The apparent increase of temperature in the first stages of intoxication is in reality a process of cooling, due to the paralysis of the terminal nerves of the minute circulation; hence, there is a diminution of both heat and force.

103. As soon as alcohol forces its way into the organism, and diffuses itself through the fluids, depression ensues; the respiration is impeded; the elimination of carbonic acid from the lungs decreased; muscular power diminished, and sensibility and consciousness blunted.

104. If active combustion or oxydation of alcohol took

What should we learn of alcohol? (98). What is its action on water &c., &c.? (99). What is said of its theoretical force value? (100). What of its disturbances &c.? (101). What of heat and force? (102). What are the effects of alcohol? (103). What facts are against the idea of its oxydation? (104–105).

place within the body, the temperature would be permanently increased; yet all, or nearly all investigators agree that the heat of the body declines. It is, therefore, utterly impossible that alcohol can be oxydated in the body and the heat and carbonic acid decreased.

105. Another fact against the combustive theory is, that none of the derivatives are found in the system. Lallemand, Perrin, and Duroy, and all other experimenters, have utterly failed to detect *aldehyde*, unless it had been administered, when it was readily discovered.

106. The presence of ashes is an evidence that something has been burnt; and as aldehyde, a derivative of alcohol, has not been detected in the animal system, as an evidence of its combustion, it must be clear to everyone that alcohol does not undergo, in the animal body, the oxydation claimed for it.

107. The greater weight of evidence being that alcohol leaves the system in the condition it entered, except, perhaps, being more or less impregnated with the fluids and solids of the tissues.

108. Therefore, until the derivatives of alcohol are found in the system, we must doubt the combustive theory. But even admitting that some of the alcohol is oxydated in the body, that will not prove its value as a dietetic. We must learn the effects of this "destruction, whether for good or evil."

109. From all the facts, the animal fire smoulders, and the temperature of the body declines, under the influence of alcohol, and that it is in part, if not wholly expelled from the body.

110. It does not aid, but retards the elimination of carbonic acid and other products of decomposition.

111. Apart from the question of what becomes of alcohol, Dr. Anstie's experiments have given valuable support to the scientific basis of total abstinence, for he said that two ounces of alcohol taken in twenty-four hours is highly injurious; though he thinks that smaller doses produce no perceptible evil.

112. But whether it produces evil effects or not, he said, "it certainly does not produce heat, and what good it does do, is by undergoing some quite unknown trans formation."

What is needed to prove the oxydation of alcohol in the body? (106–108). What are the facts? (109–110). Give remarks; (111–113).

113. As such is the latest testimony in favor of the moderate use of alcohol, surely everyone should *let it alone* until the doctors at least are able to give more definite information of its beneficial effects. In whatever way the question may be settled as to what becomes of alcohol, none of the experiments yet made have in any way affected the doctrine: that total abstinence is safe and beneficial.

CHAPTER III.

PHYSIOLOGICAL ACTION OF ALCOHOL.

LESSON SIXTH.

THE EFFECTS VARY WITH THE KIND AND QUANTITY.

114. The action of alcohol varies with the quantity and the rapidity with which it is taken. If taken quickly, in large doses, it acts as a powerful narcotic poison, even when diluted. This action is partly due to its direct effects on the stomach, its absorption into the blood, and its rapid transmission to the brain.

115. The victim of alcoholic intoxication sinks into a deep stupor, from which he can hardly be aroused; his pulse becomes feeble or imperceptible; the skin is covered with cold perspiration; the breathing slow and weak, though sometimes snorting and laborious; the eyes rolling, pupils contracted, though occasionally dilated; jaws set, and convulsions often ensue. Death may result in an hour or a day.

116. If taken as in ordinary drinking a fit of drunkenness follows as the result of more gradual or less excessive absorption. The first effect of a small dose of *dilute* alcohol (as whisky, etc.) is a feeling of warmth and comfort diffused over the system, which leads gradually to exhilaration, perhaps boisterous mirth, talkativeness, swift transition and vivacity of ideas, speedily relapsing into confusion and indistinctness, losing all sense of self-government, provoking pity and ridicule by his follies, or incurring dangers by his recklessness.

117. The flushed face, flashing eye, throbbing brain, indicate a corresponding state of excitement of the whole system; while the confusion of intellect and reeling gait denote the enthralment of his whole being. By-and-by,

How do the actions of alcohol vary? (114). What are the effects of large doses? (115). Describe the effects of small doses? (116). What is indicated by the flushed face &c.? (117).

memory fails, and he sinks powerless and stupefied, when after a varying period of time he awakes to consciousnes, to sickness, pains and depression: the result of natural laws violated, to be only dispelled when the penalty is paid.

118. Intoxication with some is never manifested in excitement or hilarity; a dreamy obliviousness is all that seems to be desired or is produced. In others it produces a querulousness or a furiousness, in which they do not hesitate to commit violence and outrage.

119. The growth of the drunkard's appetite is chiefly traceable to the after effects of intoxication, viz: the uneasy feelings always following a debauch, which he strives to relieve by a fresh recurrence to the drink; and thus a morbid appetite is created, which seeks relief, and only finds it for a time in renewed application of some alcoholic beverage, just as the natural appetite or hunger produces uneasiness that is allayed by food. This unnatural appetite for alcohol, under certain conditions, becomes a disease, and as such should be treated.

120. Dr. B. W. Richardson, F. R. S., by observations and experiments on the physiological action of the alcohols, has shown that in the progress to complete intoxication by ethylic (common) alcohol the first stage is simple exhilaration; the second, excitement; the third, rambling insensibility; and the fourth, muscular prostration and entire unconsciousness.

121. The duration of these stages are modified by the mode of administration. But whether these stages are developed or recovered from in an hour or a day, they are always present, unless the dose is in such excess that life is either endangered or instantly destroyed.

122. *The temperature* in the stage of *exhilaration* is increased; in the *second*, it begins to fall; in the *third* and *fourth*, the decline continues, reaching the lowest in the third degree. In the pigeon, whose natural temperature is 110 °, F., it was reduced to 102 °, F.

123. With the depression of force, there is a desire for sleep, when, with perfect rest in warm air, the animal heat returns, but slowly, requiring three or four times as long

Does alcohol effect all alike? (118). How is the appetite for it formed? (119). What has Dr. Richardson shown? (120). How does alcohol effect the temperature? (122). What results on depressisn of force? (123).

to regain the natural temperature as was required to reduce it to the minimum.

124. When sleep from ethylic alcohol, is pushed to its fullest extent, a long time elapses before the respiratory, circulatory and voluntary muscles cease to act. At last, nothing remains to give evidence of life but the motion of the heart and diaphragm. The final act rests with the heart, which continues to contract after breathing has ceased, and on opening the body, the auricles and ventricles on the right side are found contracting, when all outward signs of motion have ceased.

125. The post-mortem appearances after death from intoxication are very distinctive. The brain is charged with fluid blood, the sinuses distended, with exudation of serum in the ventricles and membranes, the small vessels are greatly injected. The lungs are white, free from blood, and well inflated with air.

126. The heart is full of blood on both sides, and its vessels engorged.

127. The liver is natural and the gall-bladder is not distended.

128. The inner surface of the stomach, even when intoxication is induced by the gradual inhalation of the vapor, is very much congested, and a strong alcoholic odor pervades its contents.

129. The spleen is normal. The kidneys are intensely congested, and blood exudes freely from the cortical or *outside* part, in points, or specks.

130. The bladder is usually empty. The blood on both sides of the heart is dark, but soon reddens when exposed to the air; the coagulation is firm.

131. The blood corpuscles undergo great changes, they are shrunken, crenate, and some are elongated and flattened with truncated ends.

132. These effects vary as the different alcohols used contain a greater or less amount of carbon and hydrogen. The narcotic effects are not only increased by the heavier alcohols, but the heart contains blood on both sides, and

What results if pushed to its fullest extent? (124). What are the post-mortem appearance of the brains? (125). Of the lungs? (125). Of the heart? (126). Of the liver &c.? (127). Of the stomach? (128). Of the spleen and kidneys? (129). Of the bladder? (130). Of the blood corpuscles? (131). What cause these effects to vary? (132).

the lungs contain a little more blood than in the weaker.

133. The blood itself is dark even in the arteries, and the venous blood has a dirty hue, and so viscid that it flows slowly, and when coagulation occurs the clot is loose, and gives much colored serum.

FIG. 1.—OF BLOOD CORPUSCLES.

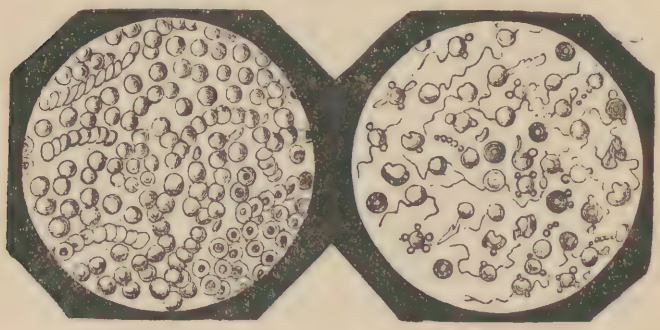

Fig. 1. *Fig.* 2.

1.—Some of them have darkened centres from the focal point, at which they are seen. Others are in rolls, indicating slight inflammation.

2.—Blood corpuscles altered from their natural state by the action of sherry wine, or dilute alcohol.

134. The blood corpuscles are not only shrunken, crenate, or elongated with truncated ends, where they lie loose, but they are mostly massed together in rolls, and appear as if each roll formed one distinct column. The fibrine, separates in rods or bands, forming a coarse network, very peculiar and distinct in character.

135. The sinuses of the brain are surcharged with blood: and the brain, whitish, is suffused with small dark points of blood.

136. The kidneys were congested, the muscles dark, containing fluid blood, which retains the odor of alcohol for hours, and resists putrifaction for several days.

137. From these experiments the animal temperature falls, and the sensations and motions are paralyzed by alcohol.

How does the blood appear? (133). What is the change in corpuscles? (134). How are the sinuses and brain changed? (135). How are the kidneys? (136). State the conclusiont from these experiments? (137).

138. The first action seems to be on the centres of voluntary motion; next the centres of consciousness, or the gray matter of the brain; then on the centres of sensation, by which sensations are transmitted to the centres of consciousness.

139. "When all these parts," says Dr. Richardson, "are under alcoholic influence, the intoxication is complete; there is all but death. And yet, this extreme intoxication is not near death, for the reason that the centres of power on which the movements of the heart and respiration depend remain, not unaffected, but perchance, so little affected, that they still are capable of sustaining a minimum of life."

140. "The animal fire smoulders, but does not go out. Every profound intoxication would be a fatal catastrophe, were not this involuntary power of the breathing and the circulation of blood especially retained."

LESSON SEVENTH.

EXPERIMENTS OF DUJARDIN-BEAUMETZ AND AUDIGE, ON THE TOXIC POWER OF ALCOHOL.

141. MM. Dujardin-Beaumont and Audige's experiments* on the Toxic (poisonous) Power of the Alcohols, confirm the experiments of Dr. B. F. Richardson, and others, besides giving definitely the poisonous doses and specific effect on temperature, etc.

142. These learned Frenchmen "made forty-two experiments" with *ethylic* alcohol, from which they ascertained that less than 2.34 grammes† (=35.310 grains) per kilogramme‡ (=nearly 35½ ounces) of the weight of the body, only passing effects were induced, during which the animal

Where does alcohol appear to act first? (138). What organs act to the last? (139). What would be a fatal catastrophe? Why? (140). What quantity of alcohol was not fatal? (142).

*For a full English translation of these experiments see Paper read by Dr. Norman Kerr, at the meeting of the British Medical Temperance Association, London, July 17, 1879. Published in the Medical Temperance Journal, October, 1879.

†A gramme is 15½ grains. ‡A kilogramme, 35½ ounces, nearly.

showed signs of fear, dullness, semi-consciousness, fled from persons with terror, and roamed around the room. Temperature fell not more than six-tenths of a degree. In five hours the initial temperature was restored, and the animal returned to its normal state.

143. With 6.18 grammes (=95.79 grains) per kilogramme (=3½ ounces) the symptoms were more pronounced. In twenty minutes the animal could not stand, it tottered, and the posterior extremities were paralyzed. The temperature fell nearly two degrees. Death occurred at the end of some days, with stripping of the skin from the caustic action of the alcohol. With 8 grammes (=124 grains) per kilogramme (=3½ ounces), the dog died in thirty-six hours, the temperature having gone down, the lowest, being nearly 5½ degrees. Dilution with water added very much to the poisonous effects of ethylic alcohol.

144. The following table presents at a glance the effects of various degrees of dilution:

TABLE III.

Quantity of Alcohol, per kilogramme, of the weight of the body in grammes	Proportion of Water in the mixture of Water and Alcohol.	Greatest decrease of Temperature	Length of Time before Death took place.		Quantity of Alcohol, per kilogramme, of the weight of the body in grammes.	Proportion of Water in the mixture of Water and Alcohol.	Greatest decrease of Temperature	Length of time before Death took place.	
Gramme.	*Per cent.*	*Deg's.*	*Dys.*	*Hrs.*	*Gramme.*	*Per cent.*	*Deg's.*	*Hrs.*	*Min.*
5.36	60	12.	3		7.49	57	4.2	36	—
6.16	60	6.3		36	7.50	70	5.1	48	—
6.57	65	2.		36	7.55	60	11.3	50	—
6.62	56	3.3		38	7.60	70	5.1	20	—
6.63	60	4.5		43	7.80	60	12.8	30	—
7.	73	2.2	3		7.83	70	13.4	30	—
7.	67	15.2		20	7.84	65	14.9	24	—
7.01	73	11.6	2		7.95	60	15.7	30	—
7.04	64	5.7		10	8.	67	12.2	18½	—
7.09	71	3.8		36	8.	67	16.2	32	—
7.24	65	4.7		48	8.53	60	18.4	12	—
7.27	70	2.4		50	14.24	55	.5	3	20

What quantities were fatal? (143). To what extent did the temperature fall? (143–144).

145. "This increase of the toxic (poisonous) power of ethylic alcohol, when diluted with water, may be accounted for by the more rapid and complete absorption of the poison than when it is administered pure and undiluted. * * * Dilution with glycerine and water added still more to the toxic properties of alcohol, death occurring in forty hours with six grammes (93 grains) per kilogramme (35¼ ounces) of the weight of the body, with a decrease in temperature of 4½ degrees; in twenty-four hours, with 6.35 grammes, with a decrease of 11 degrees. A considerable part of this last additional toxic power is attributed by the authors to the poisonous properties of glycerine."

"The marked effect of cold in increasing the death-power of alcohol confirms the accuracy of Dr. Richardson's conclusions in 1869, and justifies his enforcement of the necessity for keeping up the temperature of persons laboring under alcoholic coma."

146. "*Toxic Lesions.*—The post-mortem appearances, after acute poisoning by ethylic alcohol, are well marked. The liver is congested, and its tissues soft and friable, and is the seat of profound disorganization. The mucus membranes of the stomach and intestines are red and injected, and present at various points a blackish color, due to effused blood. Occasionally the lungs are hepatized, or softened, and the vessels are always gorged with black blood, which escapes abundantly on incision. The heart is filled with blackish clots, varying in size, and the walls have entered on the first stage of fatty degeneration. The meninges are highly congested, and the vessels of the brain are, in all cases, distended by black and thick blood; the ventricles frequently being full of serum." To this, Dr. Kerr adds:

147. "That at times the brain substance seems studded with minute red dots, the evidence of congestion of the cerebrum; blood is frequently mingled with the serum in the ventricles; the blood in the brain and other vital organs is sometimes thick, sometimes fluid, sometimes semi-fluid; and the congested venus system often presents a tree-like appearance, seen almost invariably in chronic alcoholism, known as *arbor-vitæ*, though it might be more

What effect had dilution on the toxic power of alcohol? and why? (145). What was the effect of cold? (145). Describe the toxic lesions? (146–147.)

appropriately designated *arbor-mortis*. The congestion and irritation of the mucus membranes of the stomach are in inverse ratio to the dilution of the spirit. The blood corpuscles are shrunken, and having lost their natural rounded form, present a great variety of abnormality in outline."—(See Fig. 1–2.)

ALCOHOL—ITS ACTION ON COLLOIDAL MATTER.

148. We have seen by the experiments (*L.4) of Dr. Percy, and those of Lallamand, Perrin and Duroy, and others, that alcohol accumulated in the brain substance, and hence, there appears to exist a special affinity between alcohol and the brain tissue, which may, in a measure, be explained by the effects of alcohol on colloidal matter.

149. Colloid—jelly-like—is a form of matter, which is capable of assuming organized motion, in which form one element can be substituted for another, and having a peculiar affinity for water, is able to absorb a large quantity of it. Glue is a substance of this kind, and while it is capable of absorbing a large amount of water, it may also be rendered so dry as to be broken like glass.

150. Albumen and fibrine in the brain, the blood, the muscles, and in other parts of the system, are composed largely of colloid.

151. The peculiar conditions of colloidal matter are its *aqueous*, or watery, and its *pectous*, or thickened state. The *aqueous* is the *active, living condition* of organized matter, and the *pectous*, the *passive* or *dead*. In colloidal matter, water combines, more or less loosely, with albumen and some other substances—particles of water seem to substitute particles of albumen—the adhesion being so slight, that the water is displaced by very little disturbance, and the resistance is so weak in fibrine, that its molecular cohesion is easily broken up.

152. The *aqueous colloid* in the nervous tissue is most sensitive. It is this colloidal matter in the brain which is impressed by external vibrations.

153. We must remember while considering the effects

Describe colloidal matter? (149). What is said of albumen and fibrine? (150). What are its characteristics? (151). What is said of the nervous matter? (152). What are the tendencies and effects of alcohol? (153–154).

*L with figure in parenthesis, refers to lesson, and P to paragraph.

of alcohol on the brain, the great affinity, or the attraction of alcohol for water, and that one drop of alcohol can be perfectly mixed with a pint, or, indeed, any quantity of water.

154. Alcohol, on entering the stomach, diffuses itself into the moist mucous membrane, when it comes in contact with the peripheral extremities of the colloid of the nerves supplying the alimentary canal, the heart, etc., when the effects are reflected on the vessels of the skin, and there is a temporary flushing of the vessels with blood, when a sensation of warmth is produced, heat escapes and the temperture is lowered.

155. Alcohol also finds its way by the lymphatic vessels and veins into the blood, coming into contact with the free colloid of the blood corpuscles—the carriers of oxygen from the lungs to the tissues—and robs them of their water, and their power of conveying oxygen, and nourishing the tissues.

156. In proportion as these millions of corpuscles are in good condition, so is the purity of the blood, with vigorous vitality, and mental and muscular activity.

157. The action of alcohol on the colloid not only deprives the corpuscles of some of their water, and interferes with their power to convey oxygen to the tissues, but prevents them from carrying carbonic acid from the tissues, which diminishes the chemical changes of the system, when, as a consequence, there is lessened combustion, lessened heat, and lessened elimination of waste matter.

158. The soothing effect on the nervous system, felt after taking alcohol, is due to lessened activity; for whilst it does not nourish the nerves, it paralyzes them.

159. The brain, in proportion to its size, receives more blood than any other organ, and its tissues are more aqueous. As the colloid in the brain is in the most favorable condition for the absorption of alcohol, a greater proportion finds its way to the brain than to any other organ: hence, its effects on this organ are most marked; and, from all observations, it is found for a longer period in the brain than in any other tissue.

How does alcohol act on the corpuscles? (155). What are the results? (156). What follows these effect? (157–158). What is said of blood in the brain &c.? (159).

160. Any change in the nerve tissue causes a corresponding change in production of nerve force; hence, the animation, the sparkling eye, with an increase of blood to the brain, face, and the surface of the body, which follow the use of wine or other alcoholic drink.

161. By the action of alcohol on the nerve tissue, *active colloid* is converted into *inactive pectous*. "The matter, so to speak, which was previously all in a blaze, is now burnt to a cinder, and has become hardened and effete, and is an obstruction until removed."

162. The excitement produced by the alcohol, causes an increase of blood to the part; but, by the presence of the *pectous*, or dead matter, the vessels, from the lessened activity, cannot be relieved of their blood, and there is congestion.

163. Following this excitement there is a state of oppression when sleep comes on, which is the narcotic stage of intoxication.

164. Such treatment of the most delicate organism cannot be repeated, time after time, with impunity, for functional and organic disease of the brain, liver, heart, and blood vessels, will be sure to follow.

165. Thus, we can see how the tissues are spoiled and material wasted, and how that alcohol may impede the functional activity of the organism; and while it is highly combustive, really stops combustion, and lowers the temperature; retains effete or waste materials in the system; and even in moderate doses may become the genius of disease and death.

LESSON EIGHTH.

THE EFFECTS OF ALCOHOL ON THE HUMAN BODY.

166. Drs. Parkes and Count Wallowicz performed a series of experiments to clear up some doubts in relation to the physiological and dietetic effects of alcohol. The subject of them was an intelligent, healthy soldier, twenty-

What are the results of changes in nerve tissue? (160). What change does alcohol make on colloid matter? (161). What are the results? (162-163). What will follow? (164). Does alcohol aid or stop combustion? (165). Give the object of the experiments, and the subject? (160).

eight years of age, with powerful muscles and little fat. The amount of alcohol given, though varied, was never carried so far as to produce narcotic symptoms.

167. The man, for twenty-six days, subsisted on a diet, similar as to food, except that for the first eight days he took only water (as tea, coffee, or water); for the next six days, rectified spirits, in such proportions, that in divided doses he took, on the first day, one fluid ounce (=28 C.C.) of absolute alcohol; on the second, two ounces; on the third, four ounces; on the fourth, six ounces; on the fifth and sixth, eight ounces.

168. He then returned to water for six days, and then, for three days, took on each day a half bottle of fine brandy, containing (12 ounces) 48 per cent. of alcohol; and then, for three more, returned to water. There were thus five periods, viz: water drinking, alcohol, water, brandy, water. Before commencing he had been accustomed to take one or two pints of beer daily, but abstained from alcohol for ten days.

169. During the first few days there was a gradual increase of weight, owing to the food being increased and exercise lessened; on the eighth day, the weight reached the equilibrium and remained almost uniform during the alcoholic period. There was a slight decrease during the alcoholic period; on the brandy days, slight increase, which was maintained in the after period. Other conditions remaining constant, the results of alcohol in modifying weight is quite unimportant.

170. In regard to temperature, little change was manifested when alcohol and brandy was taken as described, the change was rather an increase than a diminution.

171. The pulse was increased, both in volume and frequency, rising from 77.5, beats per minute before alcohol, to the maximum of 94.7, beats with the largest doses.

172. The capillary circulation was increased, as shown by the flushing of the neck, face, etc.

173. There was increased frequency of ventricular contractions of the heart, and increased rapidity of each contraction. The ventricles were, therefore, doing more work

How much alcohol was taken, and when? (167). How many periods and what were they? (168). What is said regarding weight? (169) What regarding the temperture? (170). What of the pulse and capillary circulation? (171–172). What of the heart? (173).

in a given time: the period of the beat being much shortened; and the blood moving faster through the capillaries; so that the increased quantity of blood thrown into the arteries was very quickly got rid of.

174. An increase of water was eliminated by the kidneys; but contrary to previous experiments, they found that as long as the ingress of nitrogen was the same, eight ounces of absolute alcohol, and twelve ounces of brandy, have *only very trifling effect* on the *elimination* of *nitrogen*, and *most decidedly do not lessen the elimination.*

175. Thus the chief effects of alcohol are on the ventricles, their contractions being greatly increased; the capillaries allowing the blood to pass more freely through them.

176. Estimating the daily work of the heart at 122 tons lifted one foot, during the alcoholic period, the heart's daily work in excess was equal to lifting 15.8 tons one foot; and in the last two days did extra work equal to lifting twenty-four tons as far. After omitting the alcohol the heart showed signs of weakness.

177. The experimenters said: "It is quite evident that alcohol is not necessary for him; every function of life was perfectly performed without alcohol; and that even an ounce in twenty-four hours produced decided effects upon his heart, and, perhaps, if the effects had continued, would eventually have lead to alterations in the circulation, and degeneration of the tissues."

178. In confirmation of the safety of abstaining from alcohol, they said: "In spite of our previous experience in the use of alcohol and brandy, we were hardly prepared for the ease with which the appetite may be destroyed, the heart unduly excited, and the capillary circulation improperly increased.

179. "Considering its daily and almost universal use, there is no agent which seems to us to require more caution, and more skill to obtain the good, and to avoid the evil, which its use entails."

180. These researches show that alcohol and brandy were neither necessary nor useful, but, on the contrary,

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What were the effects of alcohol and brandy on the kidneys? (174). Where are the effects chiefly manifested? (175). What is the estimated work of the heart? (176). What did the experimenters say? (177). What do these experiments confirm? (178). What should be done? (179).

they deranged the action of the heart, and tended to produce disease.

THE ACTION OF WINE ON THE HUMAN BODY.

181. Prof. Parkes and Dr. Count Wallowicz instituted another series of experiments to ascertain whether alcohol in wine would act in the same way, the subject of these being the same person on whom they experimented with alcohol and brandy. These experiments lasted thirty days, the man having abstained from alcoholics for sixteen days previous to their commencement.

182. Water was used at dinner for the first ten days; during the next ten days red Bordeaux was given at dinner, a half pint for the first five days, and a pint for the last five days. In the next ten days water was again given. The wine being analyzed, was declared to be claret of the best quality.

183. The object of the experiments was the effect of wine on the weight, temperature, the pulse, and the excretions.

184. No obvious change in the weight was caused by the wine. The effects on the temperature was hardly noticeable. In the first period of ten days, the mean temperature being 97°.726, and in the wine period 97°.56, or 0°.166 less; a difference so slight as might fall within the limits of an unavoidable error. The experimenters said:

185. "We conclude that the apparent heat after wine must be owing, as in the case of brandy and alcohol, rather to subjective feelings connected with the quickened circulation, that with an actual rise of temperature, but wine in the above quantities causes no appreciable lowering of temperature."

186. The wine produced marked effects upon the pulse. During the water, "the daily mean of the pulse was uniform, the mean of ten days being 76.3 beats per minute, the extreme daily variation was from 74.2 to 77.87 beats."

187. The heat was doing its work properly without wine, but when it was taken, the irritating action of alcohol in the wine was soon shown. The heart's action was

Why were the experiments undertaken? (181). What are the effects on weight? (183). What on the temperture? (184–185). What were the effects of wine on the pulse, and on the heart? (186).

increased by 4¼ beats every minute, during fourteen hours in the day, and doubtless remained the same in the other ten. In twenty-four hours there was an increase in the heart's action of 6,120 beats, or nearly six per cent. It must be remembered that the dose of alcohol was moderate, and such as some authorities say may be safely used, namely: from one to two ounces in twenty-four hours; yet this quantity deranged the action of the heart, and wasted force.

188. In this man's case, this so-called moderate dose, it is very evident, seriously deranged one of the most important functions of life, without any compensating advantage, as there was no increase of weight, nor increase of heat. The experimenters said:

189. "The general results of these experiments are, in all respects, identical with the experiments on alcohol and brandy. * * * Claret wine in the above quantities cannot so far be distinguished in its effects from alcohol. Its most marked effects—the increased action of the heart—must be ascribed to the alcohol in a great measure, though the æthers may play some slight part."

190. Thus alcohol is the all important ingredient to which wine and other intoxicating liquors owe their power to excite, to depress, to narcotize, to paralyze, to kill.

191. These experiments show that alcohol, whether in the form of brandy or wine, changes the natural action of the heart, causing it to beat with such undue rapidity that the heart of an adult man is driven to perform an increase of work equal to lifting twenty-four tons' weight in twenty-four hours, or the extra work of lifting one ton every hour.

Does wine appear to have been needed? (188). Was it useful? (188). What do we learn from the experiments? (189). What is the important ingredient in wine? (190). What were its effects? (191).

LESSON NINTH.

THE ANATOMY AND PHYSIOLOGY OF THE CIRCULATORY SYSTEM.

192. In the experiments noticed, (L. 8,) alcohol and brandy, in some cases, caused the heart to do the extra work of lifting one ton an hour. To clearly understand the cause of this action, we must know something of the anatomy and physiology of the heart and blood-vessels, or the circulatory system. By carefully examining Figs. II and III, you will form some idea of the anatomical arrangement of the heart and blood-vessels.

193. In many houses there are pipes to supply hot and cold water to the different rooms. There are also sets of pipes in our bodies, by which the blood is carried to its minutest portions. These pipes on large charts of the body, are usually red or blue, to denote the color of the blood they carry—the red being the arteries, which carry scarlet, or arterial blood from the heart, and the blue, the veins, that convey dark purple, or venous blood, to the heart. Those that carry red or scarlet blood are arteries—*air-containers*—because the ancients, when they examined these vessels found them empty, and supposed they contained air.

194. The *aorta*, the largest artery of the body, passes directly from the upper part of the heart, and bends backward till it comes in contact with the spine, when it descends along the backbone and divides into two great trunks, which pass down into the legs.

195. The arteries are formed of three coats of different materials, one coat elastic, that will stretch and then go back to its original size, when relieved of the distending force, like India-rubber; another coat is contractile, that presses upon the contents of the vessel; and the third, or internal coat, is continuous with the *endocardium*,(the lining membrane of the heart), this membrane is paved with little cells, which allow the blood to flow easily over them.

196. The *veins* (*Fig. II), like the *arteries*, have three coats, but differ from them in having comparatively

What is said of the blood vessels? (192). How many kinds are there? (193). Name, and describe the course of the largest? (194). Describe the arteries? (195). How do they divide? (196).

*Roman numerals and figures, in parenthesis, refer to diagrams, and their parts.

little elastic tissue. You will observe that the veins of the lower extremities, as they extend upward, constantly become larger by the junction of additional branches, until at last all the united branches terminate in one trunk at the heart. The branches from the arms and head, in like manner, terminate in a single trunk, also joining the heart.

Fig. II.

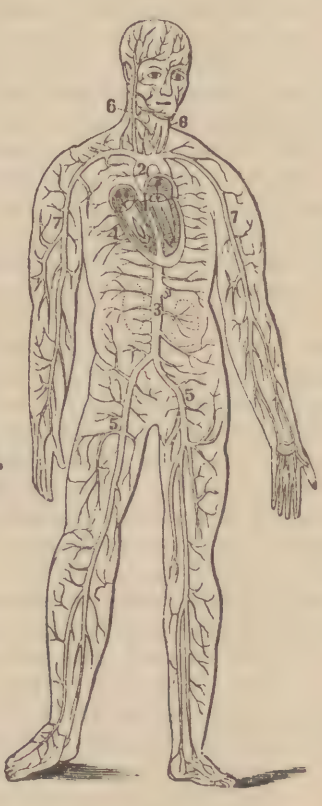

Fig. III.

Fig. 2.—Diagram of the Venous Syetem. 1, right auricle of the heart; 2, 3, large veins that open into the right auricle; 4, 4, veins of the lower extremities; 5, 5, veins of the arms; 6, veins of the neck. The arrows show the direction that the blood flows.

Fig. 3.—Diagram of the Arterial System. 1, the left ventricles; 2, 3, aorta; 5, 5, arteries that extend to the lower extremities; 6, 6, arteries of the neck; 7, 7, arteries of the arms.

197. The arteries, (Fig. III), are seen branching out into their extreme divisions, and give the outline of the limbs, brain and internal organs. After becoming invisible to the naked eye, they still continue for a considerable distance as arteries having three coats, they then empty themselves into a very fine network of vessels, finer than the finest silk, called capillaries.

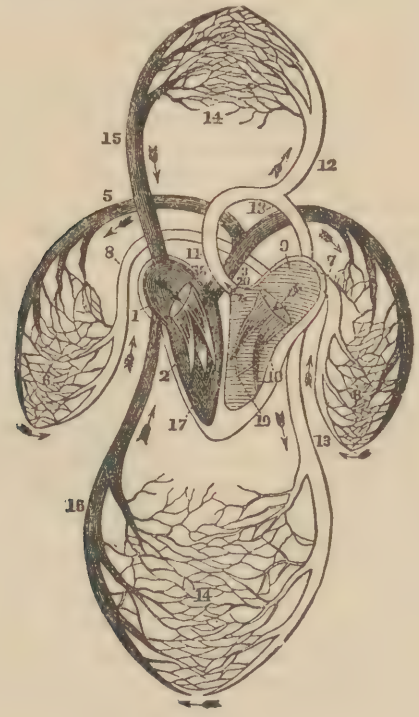

Fig. IV.

Fig. 4.—A Diagram of the Circulation of Mammals. 1, right auricle; 2, right ventricle; 9, left auricle; 10, left ventricle; 4, 5, pulmonary arteries; 7, 8, pulmonary veins; 11, 12, 13, 13, aorta and its branches; 6, 6, pulmonary capillaries; 14, 14, systemic capillaries; 17, tricuspid valves; 19, mitral valves; 18, 20, semilunar valves of the pulmonary artery and the aorta.

198. These *capillaries* (Fig. IV, 6-14) are so fine, that if 5,000 of the smallest were placed side by side, they would

Describe the capillaries and their course, &c.? (197). Describe the veins and how they differ from arteries? (198).

not measure an inch, while it would take 3,000 of the largest to make an inch. You can sometimes see them in the white of the eye, when from any cause it has become inflamed; then these little capillaries are crammed with blood. These minute vessels have not three coats like the arteries, but only one, which is continuous with the internal homogenous coat of the arteries. The capillaries are the termination of the arteries, and the commencement of the rootlets of the veins, by which the blood is carried back to the heart.

199. Thus all the blood from the different tissues and organs of the body, except that from the lungs, enters the heart by two great trunks, the one descending from the head and upper extremities, and the other passing up from the lower extremities and trunk. You will see by examining the diagrams, Figs. II and III, that the heart is hung almost in the centre of the chest, a very large portion being covered by the breast-bone; the lower portion, or apex, inclines to the left side, where it may be felt beating between the fifth and sixth ribs. The size of your heart may be estimated by doubling your fist, and its shape resembles those of the lower animals.

200. The heart is a double organ (fig. IV, 1, 2, 9, 10,) divided from above downward by a partition separating the right from the left side; each side being again divided by a partition, or valve, into an upper and lower chamber. The heart is thus formed into four chambers; the two upper chambers are called *auricles*, and the two lower *ventricles;* and are further distinguished as right and left *auricles* (1, 9), and right and left *ventricles*, (2, 10).

201. On the right side of the heart, between the upper and lower chambers, there is a three-leafed folding door, or valve, *tricuspid valve* (17), between the upper and lower chambers, on the left side, there is another folding door, which is a two-leafed valve—*mitral valve* (19). These doors or valves open into the ventricles, or lower chambers, so that the blood can pass from the upper to the lower, but not in a contrary way, when they are closed.

202. Although the blood is not allowed to flow from the lower to the upper chamber, yet it finds egress through

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Describe the heart? (199). Describe its chambers? (200). How are they separated? (201). What vessel takes blood to the lungs? (202).

another door, located in the roof of the lower chamber. This door, on the right side of the heart, opens outward, or on the outside of the heart, and into a tube, called the *pulmonary artery* (3), which sends off branches (4, 5,) to the lungs. Around the opening of this tube there are three little niches, or depressions in the tube, attached to these depressions hang three little bags. When the blood flows into the tube, these little bags hang empty within their niches, but if the blood attempts to return, they bulge out and fill the opening, looking like three little egg-cups, side by side. The left side of the heart is the same as the right, except, as already said, the door between the two chambers is a *two-leafed valve*, or door, instead of *three*, as in the right side.

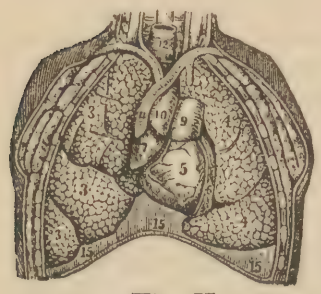

Fig. V.

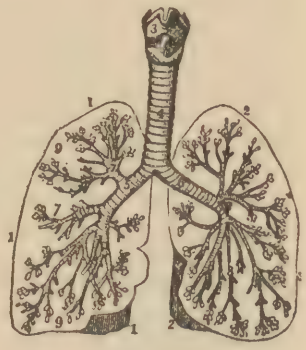

Fig. VI.

Fig. V.—The Lungs.—3, 3, 3, the lobes of the right lung; 4, 4, the lobes of the left lung; 5, 6, 7, the heart; 9, 10, 11, the large blood vessels: 12, the trachea, or wind-pipe; 15, 15, 15, the diaphragm.

Fig. VI.—The Bronchial.—1, outline of the right lung; 2, outline of the left lung; 3, larynx; 4, trachea; 5, 6, 7, 8, bronchial tubes; 9, air-cells.

203. We will now describe the way the blood circulates. Let us suppose the large veins of the body have just emptied their dark, or venous blood, into the right upper chamber, or receiving cistern. The blood then passes into the right lower chamber: as soon as it is full, the walls of the chamber press upon the blood, and the *valves*, or folding-doors, which allowed the blood to pass into the

Describe the circulation? (103).

lower chamber, close and prevent its return into the veins; at the same time the door in the roof opens, and the dark blood is forced into the *pulmonary artery*, and is carried into the lungs, and passes through narrower and narrower tubes, or vessels, until at last it enters into the capillaries (fig. IV, 6, 6,) of the lungs. These minute vessels, whose united length would extend many miles, are spread over the air-cells of the lungs (fig. VI, 9), of which it is estimated there are 18,000.

204. The dark blood on entering the capillaries of the lungs, in a few moments loses its dark color, and is returned by the pulmonary veins (IV, 7, 8,) into the left chamber of the heart, when it is a brilliant scarlet. It enters the left upper chamber, and passes thence to the lower, when, by the contraction of the heart, it is forced out of the left upper door into the large artery, the *aorta* (IV, 11, 13), the chief trunk of the stream of life, from which smaller and smaller tubes convey the blood to supply the different organs and tissues with nourishment.

205. Thus, every time the heart heats or contracts, we have two distinct circulations. The one from the right lower chamber to the lungs, to purify the blood, and then to the upper left chamber, and the other from the left lower chamber, to furnish nourishment to the body, and then to the right upper chamber, to be carried again on the round as described. (See diagrams of circulation, figs. II, III and IV).

206. When the blood is forced from the left side of the heart, it first enters the arteries, and passes from them into the capillaries. It is from the capillaries that the nutritious elements of the blood are extracted by the tissues, and in which the processes of nutrition take place. When the blood enters the capillaries it is scarlet, when it leaves them it is dark. This change is due to the fact that the red corpuscles of the blood give a portion of their oxygen to the tissues, and absorb from the tissues carbonic acid, which gives the blood its dark color. Hence, the capillaries, the intermediate vessels between the arteries and veins, are more intimately connected with the construction and function of living matter composing the body than any other part.

State the color of the blood on entering and leaving the lungs? (104). How many circulations? Describe them? (205). What is the color of blood and what causes the change? (206).

LESSON TENTH.

THE NERVOUS SYSTEM AND THE CIRCULATION.

207. A very important fact connected with the heart and the blood vessels is, that each of the minute vessels is under the control of a nerve, from which it derives its power to contract and expand.

THE NERVOUS SYSTEM is composed of white and gray matter, which are distinguished from each other, not only by their color, but by their structure, and mode of action. The white, or fibrous tissue, constitutes the substance of the nervous filaments of the trunks and branches, and is found in large quantities on the exterior of the *spinal cord*, and in the central parts of the brain. The filaments vary in size from 1-2,000th to 1-10,000th of an inch in diameter. They are not blended with each other, but lie in simple juxtaposition, each remaining distinct from its origin to its termination. They are bound together in bundles, and covered with a sheath, called *neurilemma*, (Fig. VII) in which are blood-vessels for the nutrition of the nerves. The nerve filaments are distributed to the skin, (see Fig. XIII) muscles, and glandular organs, in all parts of the body.

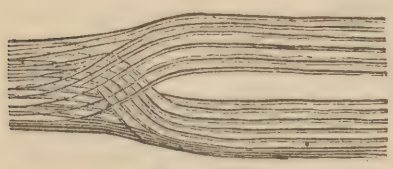

Fig. VII.

Fig. VII.—Nerve Filaments decussing with their sheath.

Fig. VIII.

A collection of Gray matter and Nerve-cells.

208. *The gray substance*, or *cincritious matter*, is found in the central parts of the spinal cord, at the base of the brain in isolated masses, and spread out as a continuous layer on the external portions of the *cerebrum* and *cerebellum*, and also constitutes the substance of all the *ganglia* of

Describe the nervous system? (207). Describe nerve filaments. &c.?(207) How is gray matter composed, and where found?(208).

the *sympathetic system*. The *gray* substance, examined by the microscope, is seen to consist of vesicles, or cells of various forms and sizes, imbedded in a grayish, granular, intercellular matter, and intermingled with nervous filaments, whose extremities are entangled in such a way that it is difficult to see the exact nature of the anatomical relations between them. (See Fig. VIII.)

209. Every collection of gray matter, whatever its relative size or situation, is called a *ganglion*, or *nervous centre*. The ganglia originate nervous power, while the nerve filaments transmit it. In the nervous system the *ganglia* are connected: first, with the different organs by bundles of filaments; and secondly, with each other by other bundles, which are termed *commissures*. Hence, the entire nervous system is made up of ganglia, nerves, and commissures.

Fig. IX.

Fig. IX.—Diagram of Human Brain, in Vertical Section.—Showing the situation of the different ganglia and course of the fibres. 1, olfactory ganglion; 2, hemisphere; 3, corpus striatum; 4, optic thalamus; 5, tubercula quadrigemina; 6, cerrebellum; 7, ganglion of tuber annulare; 8, ganglion of medulla oblangata.

Prof. Draper compares the gray cells to the cells of an ordinary voltaic battery. A nervous centre is composed of a number of nerve cells, their projecting fibres interlacing and intertwining to form a compound cell, or ganglion. These ganglia are very numerous, the largest being in the cranial cavity (see Fig. IX, of the cerebral gangila) and though many are endowed with special properties, the greater number are engaged in the production of force, controling the waste and repair, and in regulating the vigor and action of the various glands, organs, tissues, etc., composing the system. The nerves, or white fibres, take their origin from the ganglia, and are arranged in the form of tubes, covered externally by a

What is a ganglion? (209). What are the functions of the ganglia? (209).

layer of *cholesterine*, which is a non-conductor, and thus resemble the wires of an electric combination covered with an external layer of silk; and, as already said, the cells of the gray matter resemble the cells of a voltaic battery.

210. The nervous system of man consists of two portions: The *cerebro-spinal* axis, and the sympathetic system.

Fig. X.

Fig. X. (*Leidy*). Section of the Brain along the Great Longitudinal Fsssure.—1, medulla oblongata. 2, pons: 3, crus of the cerebrun; 4, arborescent appearance in section of the fundamental portion of the cerebellum; 5, left hemisphere of the cerebellum; 7, corpus callosum; 8, pellucid septum; 9, fornix; 10, anterior crus of the fornix; 19, foramen of communication between the third and lateral ventricles; 20, optic nerve; 24, oculomotor nerve; 26, fourth ventricle; 28, quadrigeminal body; 29, entrance from the third to the fourth ventricle; 30; 31, 32, anterior, middle and posterior lobes of the cerebrum.

The *cerebro-spinal system* presides over the locomotory, respiratory, sensitive and intellectual functions. This system is composed of two equal and symmetrical halves, or parts, running along the median line of the body, the different parts being connected by transverse and longitudinal commissures. A commissure is a portion of nervous matter connecting two other portions.

What is the cerebro-spinal system, and where situated? (210). What does it preside over? (210).

The *ganglia* of the *cerebro-spinal* system (Fig. XI) occupy the cavities of the *cranium* and the *spinal canal*, and send out their nerves through the openings in the bony walls of these cavities. From the centres of the cerebro-spinal system, the nerves of the sense go to the organs of sense; the nerves of sensibility, or sensation, are distributed to the skin and other sensitive surfaces; and the nerves of voluntary motion go to the muscles; and in health, all perform in harmony their respective functions. To the gray matters of the hemispheres of the cerebrum may be ascribed the mental faculties of the intellect, memory, judgment, reason, etc.

Fig. XI.

Fig. XI.—Back View of the Brain and Spinal Cord.—1, the cerebrum; 2, the cerebellum; 3, the spinal cord; 4, nerves of the face; 5, the brachial plexus of nerves; 6, 7, 8, 9, nerves of the arm; 10, nerves that pass under the ribs; 11 lumber plexis of nerves; 12, the sacral plexus of nerves; 13, 14, 15, 16, nerves of the lower limbs.

211. The Ganglionic, or Great Sympathetic System, presides over the functions of *vegetative life*, and is located anterially to the spinal column and in the visceral cavities of the body. This part of the nervous system is symmetrical in the neck and thorax, but is unsymmetrical in the abdomen, where it attains its greatest size, and its most complete development. It consists of a double chain of ganglia, running down the sides of the spinal column, being connected with each other by transverse and longitudinal commissures. From these gan-

What is the sympathethic system, and where situated? (211).

glia, nerve filaments are distributed to all the active vital parts of the body. (See Fig. XII.)

Fig. XII.

Fig. XII. — Represents the Sympathetic System, or Ganglia, and their connection with other Nerves.—A, A, A, the semilunar ganglion; D, D, D, thoracic (chest) ganglia; E, E, the external and internal branches of the thoracic ganglia; G, H, the right and left coronary plexus; I, N, Q, the inferior, middle and superior cervical (neck) ganglia. 1, the renal plexus of nerves; 2, the lumber (loin) ganglion; 3, their internal branches; 4, their external branches; 5, the aortic plexus of nerves.

212. The local control exerted by the nervous system is very great, and of immense importance. When a person exposed to cold contracts catarrh, or inflammation of the lungs, it is produced through the nervous system, the influence of the cold on the skin is conveyed to the nervous centres, and influence the *vaso-motor nerves* (as the nerves are called which govern the walls of the vessels), so as to cause their partial paralysis, and produce a state of congestion, or undue distension of the vessels, which often ends in inflammation.

The heart, we know is affected by all forms of emotion; men and women faint, and have sometimes been killed by sudden news of a joyful or sorrowful nature. When they faint or die in this manner, it is because the action of the brain arrests the heart, as a watch is stopped by breaking the spring. On the other hand, some emotions produce great rapidity of the heart's action, called palpitation.

213. The heart is supplied with three sets of nerves—one by the *ganglia*, or masses of nerve-cells, in its substance; another from the *sympathetic* system; and the third by the

What nerves control the heart, and govern the emotions? (212). What nerves govern the heart? (213).

pneumogastric nerve, that proceeds directly from the brain. There is reason to believe that the regular rhythmical succession of the ordinary contraction of the heart depends upon the ganglia within its substance, as it still continues to beat after it is removed from the body, and its connection with the *sympathetic* and *pneumogastric* nerves severed. The influence which increases the heart's action, (there is reason to believe), is derived from the sympathetic, and that which arrests the heart's action, from the pneumogastric. Another peculiarity of the sympathetic nerves is, that they follow the distributions of the blood-vessels. Starting from the heart, they envelope the large vessels with a close network, called a plexus. (See Fig. XIV.)

Fig. XIII.

Fig. XIII.—A Diagram of the Skin.—1, 1, cuticle; 2, 2, the soft layer; 4, 4, the network of nerves; 5, 5, the dermis; 6, 6 the nerves that divide from network 4, 4.

214. Let it be remembered, that the *primary*, or *sympathetic* system, is that of *organic*, or *vegetative life*, and governs the purely *involuntary motions;* and that its centres are supposed to be the seats of the faculties of the emotions and instincts. And that the *cerebro-spinal* system—the centres of the brain and spinal cord—are the *centres* of *voluntary motion*, *volition*, *reasoning*, and other faculties of a directly *intellectual* nature.

What must be remembered ?(214).

215. That the minute blood-vessels, at the extremities of the circulation, are under the control of the primary, or organic nervous system; that branches of nerves from the organic centres accompany every minute vessel throughout the body to its termination, and without any control, or influence of the *will*, regulate the contraction or expansion of the blood-vessels: or, in other words, determine whether the passage through these tubes should be wide and free, or narrow and obstructed. Thus, while the small arteries and veins lose the functions which the capillaries possess, of directly supplying the tissues with blood by transudation, they gain that of regulating the supply of fluid to the capillaries. (See Fig. XIV.)

Fig. XIV.

Fig. XIV.—Capillary Plexus, or Network.

216. Thus, the contraction, or dilatation of the arteries supplying a set of capillaries, has the same results as lowering or raising the sluice-gates of a system of irrigating canals. The effect of this power of the nervous system is to give control to certain localities, while the force of the heart may remain the same. Blushing is only a modification of the circulation. When an emotion, pleasurable or painful, takes possession of the mind, a hot flush is felt, and the skin becomes red, according to its intensity, which may be confined to the skin of the cheeks, or extend all over.

217. These changes are caused by the sudden dilating of the small arteries, which allow an increase of hot, red blood to enter them—the result of the suspension of nervous action, or control. On the other hand, extreme terror, or sudden fear, causes the skin to become suddenly cold, and the face to be pale and pinched. This is caused by a diminished supply of blood to the skin, and results from the excessive stimulation of the nerves governing the small arteries, causing them to contract, and thus the supply of blood is cut off. By understanding these anatomical arrangements of the heart, the blood-vessels, and the nerves, with their physiological function, we shall be able

What nerves govern the circulation? (215). What effect have they? (216). What effect has terror? (217). What effect has over stimulation of the nerves? (217).

teo understand the action of alcohol on the blood-vessels, the heart, and on the temperature of the body, and will be able to clearly perceive the fallacy of the notion that alcohol is either a stimulant or a heat producer.

LESSON ELEVENTH.

THE ACTION OF ALCOHOL ON THE HEART.

218. While investigating the nature of certain chemical substances, Dr. Richardson discovered that nitrate of amyle caused an increase of the heart's action, resulting from its paralyzing effects on the organic nerves of the minute circulation, described in the last lesson.

219. Nitrate of amyle is obtained by heating amylic alcohol—fusil oil—gently with nitric acid, and removing it from the heat as soon as bubbles form, and repressing the effervescence, if too strong, by cold water.

220. Nitrate of amyle, when inhaled, acts immediately as a powerful stimulant to the heart, and is said to be the most powerful agent known. A little applied to the nostrils causes an instantaneous flushing of the face, and the heart to beat rapidly.

221. Dr. Richardson discovered a class of chemical agents that has this peculiar action of relaxing the blood-vessels, at their extremities, among which are the whole class of nitrates, and the whole series of alcohols.

222. Ethylic (common) alcohol, he found, had the power of paralyzing the minute blood-vessels; when they become dilated and filled with blood. The effects of this paralysis is seen in the flushed faces of both ladies and gentlemen, after drinking wine or other intoxicating beverages. The same is seen in the flush caused by the reaction of heat, or cold, and by *nitrate of amyle*, and is the same as blushing.

223. This action results from the diminished power of the nerves over the small blood-vessels, allowing them to become relaxed, or dilated, by the pressure of the blood.

What did Dr. Richardson discover? (218). What is nitrate of amyle? (219). What does it do? (220). What other agents act in this way? (221). What effect has alcohol? (222). And why? (223).

This is indeed congestion, and is, as Dr. Richardson says, the first stage of intoxication, or, vascular excitement, produced by alcohol. With this disturbance of the power of the small blood-vessels, or the paralysis of the terminal nerves by alcohol, a disturbance is produced in other organs, and one of the first organs to feel this disturbance is the heart.

224. Let it be understood, that when the heart is in a healthy condition, with each beat a certain amount of resistance is offered by the vessels, a result of the nervous forces controling them, and the beat of the heart is regulated both in tension and time. But when this nervous control is reduced or lost, the vessels are relaxed, the resistance is weakened; then the heart begins to beat faster, like a clock when the pendulum is shortened. And, though the heart has lost nothing of its force, its beat is increased in frequency, and its recoil stroke is weakened.

225. Physiologists, in their researches, have shown that the mechanical division of a nerve, which regulates the vessels' supply, causes the flushing of those vessels with blood. Thus, if we could temporarily divide with a knife the nerves that supply the vessels of the body, we should temporarily produce the same conditions that are produced by alcohol. The heart would be allowed to work against reduced resistance, while the vessels of the skin and organs would be intensely filled with blood; and if this operation were repeated as often as persons use wine and other alcoholic beverages, structural changes would take place, and organic diseases would be produced, as they are, by alcohol.

226. Thus alcohol paralyzes the brain and nerve centres, and all the vital organs having fine, minute vascular structures governed by nervous currents.

227. We may, therefore, easily comprehend how alcohol produces the quickening of the heart and the pulse in the first stage of its deranging action. This increase, in some cases, may be equal to one-fourth of the heart's natural rate.

228. We have seen (in L. VIII) that Drs. Parkes and Count Wallowicz counted the beats of the heart of a healthy young man, at regular intervals, when he drank

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What is the condition of the heart not under the influence of alcohol? (224) What effect has the division of a nerve? (225). What does alcohol do? (226..

only water, and also when under the influence of alcohol, taken in increased quantities. Step by step, they measured precisely the action of alcohol on the heart, and thereby its primary effects on the body.

229. By these experiments, the average number of beats of the heart, during twenty-four hours in the water period, was 106,000; while in the earlier alcoholic period, the beats were 127,000, or about 21,000 beats more; and in the later period, it was 131,000, or 25,000 more beats than in the water period.

230. With one ounce of alcohol the heart beat 4,300 times more.

With 2 ounces of alcohol the heart beat 8,172 times more.

"	4	"	"	"	"	12,960	"	"
"	6	"	"	"	"	18,672	"	"
"	8	"	"	"	"	23,904	"	"
"	8	"	"	"	"	25,488	"	"

231. Thus, the first day of alcohol gave an excess of four per cent., and the last twenty-three per cent. The mean of these two days was almost the mean of the six days. If each beat of the heart was as strong during the alcohol period as in the water period—the experimenters say it was stronger—the heart, on the last two days, was doing one-fifth more work. At the lowest estimate, the heart was doing an excess of work equal to lifting more than fifteen tons one foot. Let us try to make it clear.

232. This man's heart beat in the water period 73.57 strokes a minute, which, multiplied by 60 minutes an hour, and then by 24 hours per day, will be nearly 106,000 strokes for the day. But if we allow for the decrease of beats during sleep and lying down, 6,000 strokes, it will give a general average of 100,000 beats in 24 hours.

233. With each beat of the heart, the two lower chambers, or ventricles, squeezed out, or lifted into their respective vessels about a quarter of a pint of blood, or more, say by weight, three ounces from each, or six ounces for both, which will be 600,000 ounces. The heart has to force this mass of blood through the vessels, and in doing this, does work, each day, equal to lifting not less than twenty

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Give the number of beats of the heart under the influence of water and alcohol ? (229–230). What amount of work was the heart doing under the influence of alohol more than water? (231). Give rate of pulse etc.? (232). What amount of blood does the heart lift? (233).

tons; as the lowest estimate that has been given of the daily work of the heart is equal to lifting twenty-two tons one foot high.

234. The increase of the heart's work, caused by alcohol, was as follows: Four ounces of spirits, in twenty-four hours, increased its work one-eighth; six ounces, one-sixth; and eight ounces, one-fourth. Or—

235. The effects of alcohol on the heart may be illustrated thus:

	Beats of the heart in 24 hours.	Tons lifted one foot.
By 8 ozs. alcohol, or ¾ pt. brandy,	124,000	150
By 6 " " " ½ " "	118,000	142
By 4 " " " 1 " port wine,	113,000	136
By 2 " " " 1 " strong ale,	108,000	130
By 1 " " " 1 " porter,	104,000	125
Natural, or without alcohol,	100,000	120

This shows the unnecessary work the heart is forced to do by intoxicating drink, as one ounce of alcohol, or a pint of porter, makes the heart, in twenty-four hours, lift five tons more than it would have done without it. Two ounces make it lift ten tons; four ounces, not leas than sixteen tons; six ounces, twenty-two tons; and eight ounces, about thirty tons; or one-quarter as much again as without it. This is a great strain on the heart and blood-vessels; and should the quantity imbibed be increased as is usually the case, structural changes will be the result.

236. As all the organs are built on vascular structures, capillaries, etc., it follows that prolonged paralysis of the minute circulation must, of necessity, lead to the disturbance in other organs.

237. The flush on the cheek during alcoholic excitement clearly indicates the condition of the lungs, the brain, the spinal cord, the liver, the spleen, the kidneys, and, indeed, all the other vascular organs. It is this increased action of the heart, which has gained for alcohol the name of a *stimulant*, which simply means a *spur*. And just as a *spur* driven into the sides of a jaded horse will make him move faster for a time, so alcohol quickens the action of the heart; and as the horse will be the weaker for the

What is the increase of work caused by alcohol? (234). What quantity of the various drinks is needed to produce distinct physiological results? (235). What will be the results of an increased quantity? (236).

greater exertion it was spurred on to make, so the heart that has been urged to increased work by intoxicating drinks, when the alcohol is used up, or eliminated, goes slower for a time, by reason of its exhaustion, from the increase of work forced upon it and the more it has been over-worked, the more rest will be needed, and like an over-worked horse, it will wear out more quickly than is natural; so, that when a man becomes old, his heart fails him when he has extra work to do, or in sickness. Two ounces of alcohol, or a pint of strong ale, a day, increase the heart's work equal to lifting ten tons one foot, which is rather more work than lifting one pound a thousand times an hour one foot high. What human hand could do this work for one hour in twenty-four? Yet the heart is forced to do this amount of extra work for twenty-four hours in the day, and that often for years together. We cannot wonder that the heart should flag, and be worn out under the lash of the tyrant alcohol: that heart disease should be so common, and the hearts of those who use alcohol should suddenly stop under some extra physical exertion or mental excitement.

CHAPTER IV.

ALCOHOL—IS IT POISON OR FOOD?

LESSON TWELFTH.

IS ALCOHOL A POISON.

238. What is a poison? Webster says: "A poison is any agent capable of producing a morbid, noxious, or dangerous effect upon anything endowed with life."

239. Taylor says (Medical Jurisprudence): "A poison is commonly defined to be a substance which, when administered, or taken in small quantities, is capable of acting deleteriously on the body. * * * Or a substance, which absorbed into the blood, is capable of seriously affecting health or destroying life." He also says: "It is usually considered that a medicine, in a large dose, is a poison, and a small dose is a medicine."

240. "Poisons," says Copland, "are substances which exert a deleterious influence on the human frame, when taken internally, or applied externally, as regards either their nature, or quantity employed, or which tend in either respect to destroy life when thus used."

241. Prof. Christison (Treatise on Poisons) divides poisons into three classes, viz: I, Irritant poisons: those that excite inflammation, among which are the mineral acids. II, Narcotic poisons: that operate on the brain and nerves, and include opium, hydrocyanic acid, etc., etc., and III, Acrid-Narcotic poisons, which are local irritants, like those of the first class, and afterward produce effects on the nervous system, like those of the second class, and include nightshade, hemlock, foxglove, nux-vomica, tobacco, alcohol, æther, etc.

What is a poison? (239-240). How are poisons divided? (241).

242. Prof. Christison (Dispensatory) describes alcohol in its relation to the living animal system as, *first:* a local irritant. *Second:* an astringent. *Third:* a sedative.

243. Familiar and universal speech give evidence that alcohol is a poison. The literal meaning of the term used to describe a person under the influence of alcohol—*intoxicated*—is *poisoned*. The word intoxicated being derived from the Greek word, *Toxicum*, meaning a bow or an arrow; the barbarians used to poison their arrows; and in Latin, was used to signify poisons; from which we have the word, *Toxicology*, the science which treats of poisons and poisoning.

244. Intoxication, in plain English, means the state of being poisoned, and is limited to the effects of certain substances upon the nervous system, which are associated with disturbances of the mind, delirium, etc.

245. By the action of alcohol on the living body, it is very clearly a poison in large doses; and though absolute alcohol is not usually used by man, we have ample evidence of its effects upon the lower animals. Prof. Regnault injected strong alcohol into the veins of animals, which produced instant death, as he thought, by coagulating the albumen in the blood.

246. Flourens observed, in some experiments, that alcohol produced effects on the movements of birds similar to those produced when the cerebellum, or lesser brain (see 5, Fig. IX) was removed, with this difference, that when alcohol was administered, the animal lost the use of its senses and intellectual faculties; while if the cerebellum was only removed without alcohol being given, it preserved its senses.

247. Dr. Percy, in the experiments already mentioned, injected two and a half ounces of alcohol into the stomach of a full grown dog, which uttered a loud, plaintive cry, and fell lifeless. Not a gasp was afterward taken; and after a minute or two, not a pulsation of the heart could be felt. "Never," said Dr. Percy "did I see every spark of vitality more effectually and more instantaneously extinguished." Death, in this case, was like poisoning by prussic acid.

248. In another case, six ounces of alcohol were injec-

How does Prof. Christison class alcohol? (242). What is the meaning of intoxication? (243–244). In what doses is alcohol a poison etc.?(245–246). Name some of Dr. Percy's experiments? (247–252).

ted into the stomach of a large dog, which was followed by entire loss of sensibility and voluntary movements. The animal fell and never moved a limb. Respiration continued an hour, gradually becoming slower and laborious; the heart continued to act for a few moments longer: the last pulsation being just one hour and twenty minutes from the time the alcohol was introduced. The symptoms in this case were those of opium, or other narcotic poisoning; the effect being similar to mechanical lesion of the medula oblongata. (See Fig. IX, 1.)

249. In another experiment, three ounces of alcohol being injected into the stomach of a dog, it howled loudly, once or twice, and fell prostrate, with slight convulsive extension of the trunk and limbs. Death appeared to take place as in the first case; but it was only apparent; for though the respiration was arrested for a time, the heart continued to beat, and after the lapse of three minutes a sudden, deep inspiration was taken; after forty minutes, the animal gave signs of life, returning consciousness, and voluntary power. But it soon lay down again, and made no effort to move, but moaned as if in great pain, and died eight hours after the administration of the poison.

250. In the fourth and last case, to be now noticed, two and a half ounces of alcohol were injected into the stomach of a full grown spaniel, by which all the ordinary symptoms of alcoholic intoxication were manifested.

251. In twenty-five minutes she vomited frothy mucous; became extremely restless, occasionally moaning, whining, and howling, as if in great pain. Nine hours after she was found sitting up, and attempted to walk, but her hind legs seemed to be paralyzed, and for several days there was a lack of power over the hind limbs.

252. These experiments by Dr. Percy, and the observations of other scientists, prove that alcohol, in large doses, is certainly a poison.

253. Dr. Huss has well described the effects of the long continued use of alcohol in moderate doses. To three dogs, of different ages, dispositions, etc., six ounces of potato brandy were daily administered to each, in divided doses. At first, the animals did not show any aversion to

Describe Dr. Huss' experiments? (253-256).

the liquor; but at the end of a month it had to be forced into them.

254. During the first three months they displayed a liveliness approaching to delirium; their appetites were voracious, and they were always thirsty.

255. In the fourth month their bark began to grow hoarse and lost its clear tone; a harsh dry hiccough and cough accompanied; the eyes were watery and staring; the sense of hearing less acute; the whole manner listless; the sleep disturbed by spasms of the limbs; they often uttered plaintive cries; they seemed averse to all exertion, and preferred lying on the side. After this they were tremulous; and on standing, the hind legs were so weak that they ate sitting; and as they lay twitchings were visible in the muscles of the trunks and limbs; and, although generally indifferent, the sight of other dogs excited them to violent anger, and furious attacks, in spite of their weakness. Their strength declined; the sensibility diminished, and their appetites became so impaired that they refused even to devour raw meat. None of these dogs lost flesh, but were fatter than when the experiments began. One died at the end of eight months, with signs of complete exhaustion; the others were killed, when similar changes were found in the bodies of all.

256. The stomach was contracted, its mucous membrane lead-colored and œdematous, but covered with thick and fetid mucous. The liver was considerably enlarged, of diminished consistence and of a darker color; the bile was black, thick, and stringy.

257. Duchek gave a dog a half ounce of absolute alcohol daily, which was regularly followed by intoxication. Emaciation and weakness occurred in the hind limbs, and, finally, death.

258. The effects of alcohol on man are precisely those as upon the lower animals. In numerous cases death has instantaneously resulted from large doses. Indeed, these cases are so common that we need not stop to enumerate them. That alcohol is a poison is a scientific commonplace, as well as a scientific verity.

259. No man ever daily invaded his system with alcohol

Give Duchek's experiment? (257). Is alcohol a poison? (258). Can man take alcohol without injury? (259),

without injury being inflicted on some part, or the whole of his organism. For further evidence of its poisonous properties see experiments in Lessons Fourth, Sixth, and Seventh.

LESSON THIRTEENTH.

PHYSIOLOGY OF NUTRITION—PROXIMATE PRINCIPLES.

260. The study of nutrition naturally commences with the proximate principles, or the substances composing the body. A proximate principle is any substance, simple or compound, that exists in its own form, in the animal solids or fluids, and can be extracted without altering or destroying its chemical properties. The proximate principles are organic and inorganic, and are generally divided into three classes, which include all the fluids and solids of the animal body.

261. The proximate principles of the first class are purely inorganic, and are found everywhere in organized and unorganized bodies. They have a definite chemical composition, among which are water, chloride of sodium (common salt), carbonate and phosphate of lime, carbonate of soda, potassa, etc., etc.

262. The proximate principles of the second class are of organic origin, and are only found in nature as ingredients of organized substances, and are starch, sugar, fats, or oils, etc.

263. The proximate principles of the third class are the organic substances proper. They are of very great importance, and called albuminoid substances, or proteine compounds, and sometimes proteids. These being the elementary constituents of the solids, semi-solids and fluids of the body, it necessarily follows that the elementary constituents of foods must be the same as those composing the body itself, or that are formed in the course of the vital processes. All alimentary substances belong to one or the other of the three classes.

What is a proximate principle? (260). What are the first class of proximate principles? (261). What are the second class of proximate principles? (262). What are the third-class proximate principles? (263).

264. The first class, or inorganic substances, are water, and the salts of the various alkalies, earths and metals, to which we may add oxygen; but as oxygen is not taken into the body by the alimentary canal, but by the lungs, it hardly comes within the ordinary term of food.

265. The second class, the non-nitrogenous substances, are the amyloids, or starch, sugars, gums, etc., which are composed of carbon, hydrogen and oxygen, the two latter elements being in the proportion in which they combine to form water. The fats or oils, while they belong to this class, and are composed of the same elements, contain more hydrogen atoms than sufficient to form water, if united with their oxygen.

266. The Third Class—*Albuminoids*, or *Nitrogenous Substances*, are composed of four elements, carbon, hydrogen, oxygen and nitrogen, and sometimes sulphur and phosphorous. The substances of this class are the gluten of flour, the albumen (white of egg) in the serum of the blood, the fibrine of the blood, the casein, one of the constituents of cheese, and other substances. While gelatin obtained from bones, and chondrin from cartilage, are considered as allied to this group.

267. These substances composing the animal body are therefore indispensible; and every substance to serve as food must contain a sufficient quantity of these principles, organic and inorganic, to keep up their proportions existing in the system.

268. It has been proved by experiments that a healthy, full-grown man, requires for his daily subsistence nineteen ounces of bread, which contains glutin (an albuminoid substance), sugar, starch, and minute portions of fat. Of meat, sixteen ounces, which, besides fibrine, usually contains from thirty to fifty per cent. of fat. In addition to these, three and a half ounces of butter, or fat, and fifty-two fluid ounces of water are needed. Thus, a man daily consumes about two and a half pounds of solid food, and a little over three pints of liquid. The food must not only contain the proper amount of these ingredients, but must be soluble in the alimentary canal

What aliments comprise the first class? (264). What class are non-nitrogenous? Describe them? (265). What are nitrogenous? Describe them? (266). What do these principles compose? (267). What does a healthy full-grown man need? (268).

THE PROCESSES OF DIGESTION.

269. The functions of the alimentary canal, and its secretions, are to dissolve the food, and to separate nutritious portions from the innutritious, that they may pass through the delicate structures that form the walls of its vessels.

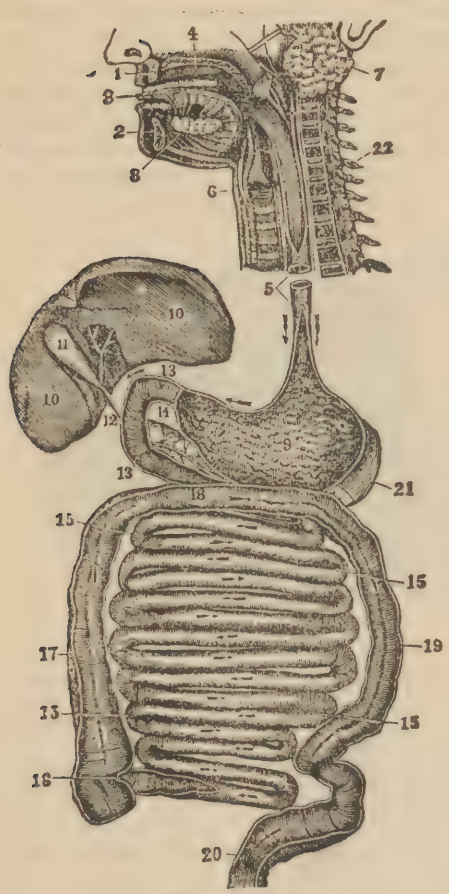

Fig. XV.

Fig. XV.—A view of the Organs of Digestion. 1, upper jaw; 2, lower jaw; 3, the tongue; 4, roof of the mouth; 5. the œsophagus; 6, the trachea; 7, the parotid gland; 8, the sublingual gland; 9, the stomach; 10, 10, the liver; 11, the gall-cyst, or sac; 12, the duct that conveys the bile to the duodenum (13, 13); 14, the pancreas; 15, 15, 15, 15, the small intestines; 16, the opening of the small intestines into the large intestine; 17, 18, 19, 20, the large intestine; 21, the spleen; 22, the upper part of the spinal column.

270. To effect this the food is masticated in the mouth, and mixed with the secretions of the parotid, submaxillary and sublingual glands. (See Fig. XV-7-8). The secretions of these glands with the secretions of the small glands of the mouth constitute the *saliva*, which contains an organic principle called *ptyaline*, that has the power or property to change the *starch* into *grape sugar*. By the process of *mastication* and *insalivation*, the food is prepared for deglutition, or swallowing. It then passes down the *œsophagus*, (XV–5) or gullet, into the stomach, through the *cardiac* opening.

271. Before the food enters the stomach, its mucous membrane is pale and only just moist, but as soon as the food touches the mucous membrane, its arteries, which before were contracted by the nervous power already explained, now become dilated, and the glands of the stomach (See Figs. XVI and XVII) receive a greater quantity of blood, and the gastric juice begins to flow, or to be secreted. The gastric juice contains saline matters in solution; a dilute acid—hydrochloric, or lactic—and an organic principle called *pepsine*, which if precipitated by alcohol or heat, loses its power to digest solid food.

Fig. XVI.

Fig. XVI.—Small Portion of the Mucous Membrane of the Stomach, with the Imbedded Gastric Glands.—1, the glands; 2, orifices of the glands; 3, Epithelium of the mucous membrane, moderately magnified.

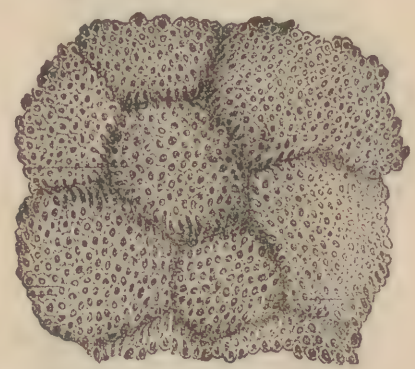

Fig. XVII.

Fig. XVII. (*Leidy*). The Mucous Membrane of the stomach, moderately magnified, exhibiting the orifices of the gastric glands.

272. The juices of the stomach act mainly on the albuminoid substances of the food, and changes them into albuminose, or peptone, which being perfectly fluid, is readily absorbed by the vessels of the alimentary canal. Starchy matters cannot pass through the walls of the vessels, but sugar can very readily; hence, starch in the process of digestion is converted into sugar. The gastric juice only acts upon albuminoid substances. In the stomach the fats are merely released from the albuminoid

What is digested in the stomach? (271). What in the small intestines? (272).

tissues and exposed to the action of other agents. The conversion of starch into sugar, which begins in the mouth, is partially, if not wholly, arrested by the acidity of the contents of the stomach; for *ptyaline* of the saliva is an alkaline, or neutral mixture. In the stomach, the food is reduced to *chyme*, in which state it is allowed to pass through the *pyloric* orifice into the duodenum, while the albuminose, or peptone, with the sugar already formed from starch is absorbed by the vessels of the stomach into the current of the blood.

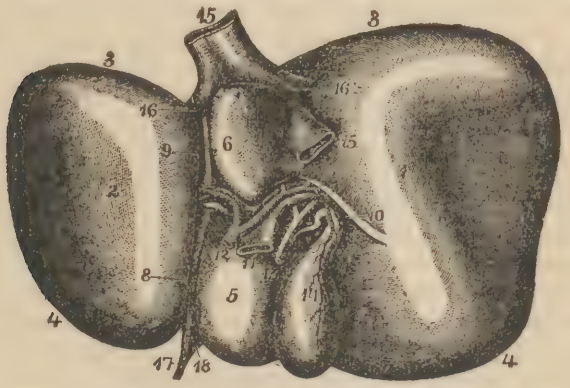

Fig. XVIII.

Fig. XVIII. (*Leidy.*(Interior Surface of the Liver. 1, right lobe; 2, left lobe; 3, posterior margin; 4, anterior margin; 5, quadrate lobe; 6, caudate lobe; 7, Isthmus, or caudate process, connecting the latter with the right lobe; 8, 9, longitudinal fissure; 10, transverse fissure; 11, portal vein; 13, hepatic artery; 13, common billary duct, formed by the union of the hepatic and cystic ducts; 14, gall-bladder; 15, interior cava; 16, hepatic veins; 17, round ligament; 18, anterior part of the suspensary ligament.

273. The remaining portions of the food, in the form of chyme, meets with the bile and pancreatic juice in the duodenum (XV–13). The pancreatic juice, secreted by the pancreas (XV–14) is an alkaline fluid, similar in some respects to the saliva, and contains an organic or albuminoid principle called *pancretine*, which converts starch into sugar. The bile and pancreatic juice (Fig. XV–11), mix-

What is pancreatic juice? What does it do? (273). How does sugar reach the heart? (273). How the chyle, etc.? (273).

ing with chyme, converts it into chyle. In chyle the fatty matter is in a state of complete emulsion, as butter is when naturally suspended in milk. During these processes, the dissolved portions of food are forced along the alimentary canal and are absorbed by the vessels. The parts of the food rendered liquid and capable of forming a homogeneous mixture with the plasma of the blood are chiefly absorbed by the blood-vessels, and conveyed by the *portal vein* (XVIII–11) to the liver and thence to the heart; while the fat, in the form of an emulsion, or chyle, is taken up by the lacteals, and passes through the several rows of *mesenteric glands*, and is conducted to the *receptaculum chyli;* thence through the *thoracic duct*, and discharged into the left subclavian vein, and mingling with the venus blood, is emptied into the right upper chamber of the heart—the *right auricle.* (IV–1.) These substances in the *thoracic duct* and the *right side* of the heart, appear as a mixture of oily molecules: but while passing through the pulmonary circulation (IV-6), or the lungs, disappear; but what becomes of them, or what chemical change they undergo is not known. The food elements thus prepared and taken up into the circulation in the forms of *albuminose*, *sugar* and *chyle*, it must be understood, are only temporary; for, by catalytic transformation, they soon pass into other forms, and become assimilated with the pre-existing elements of the circulating fluid; thus are accomplished the objects of digestion—the supplying of new materials from without to build up the animal organism.

LESSON FOURTEENTH.

IS ALCOHOL FOOD?

274. The essential ingredient in all intoxicating drinks is alcohol, which, by all *toxicologists*, is classed as a poison, when taken in large quantities; yet there are persons even among the medical profession who seem to be unable to distinguish between a poison and a food.

What is said of poisons? (274).

275. Poisoning, it is true, may differ in degree. If only those substances were classed as poisons that produce fatal effects at once, their number would be very few. It is little less than absurd to suppose that a substance which destroys life in large doses, in small ones is a food. Two pounds of good bread or beef are no more a poison than two ounces. While one-sixtieth of a grain of strychnia may not destroy life, it is nevertheless a poison, and no one on that account would say it is a food in small quantities. The first inhalation of the pestilential poison, though unperceived, is none the less a poison, and will eventually strike down with disease those who continue to breathe it. The first inspiration was perhaps as poisonous as the last, though neither the one nor the other alone would have produced any very serious results on a healthy, vigorous system. If alcohol is a poison, it cannot by any straining of logic be a food. "A poison is any substance that disturbs life's healthy movements, and is not capable of being converted into, or become a part of, the living organism."

276. "Under the term food," says Dr. Dalton, "are included all those substances, solid and fluid, which are necessary to sustain the processes of nutrition. The first act in the process of nutrition is the absorption from without of those materials which enter into the composition of the living frame, or others, that may be converted into them within the interior of the body." Does not the effects of alcohol correspond with that of a poison?

277. Liebig taught, that though alcohol could not be regarded as a tissue-forming substance it was a calorifiant, or heat-producing agent. This idea had many supporters, who maintained its value as a respiratory, or heat-giving food. Liebig never gave any proof of this doctrine, and though Dr. F. R. Lees denied it, and others doubted its truth, without any facts to sustain the idea, it had a long reign. Many learnedly wrote and talked about the respiratory and heat-giving power of alcohol, while not a single fact was advanced to show that it was burned or decomposed in the body.

278. Then followed Prof. Moleschott's doctrine, that if alcohol was not food itself, it made food last longer,

What is included under the term food? (275). What is necessary of all foods? (276). Give Liebig's doctrine, etc.? (277). What was Prof. Moleschott's doctrine? (278).

being a sort of saving-box. It was discovered that alcohol destroyed molecular life by narcotizing it, and where there was less life there was less waste, and, as a consequence, less need for food. These errors, like many other absurd notions about alcohol, died amid their worshippers.

279. That alcohol should not lose its character as a food in some sense or other, the late Dr. Anstie advanced another theory, and labored earnestly in his book on "Stimulants and Narcotics," to prove that alcohol was, in certain doses, a *stimulant*, in others, a *narcotic*, and not a poison; and by attaching to words other definitions, tried to prove that food is medicine, and medicine is food; and, as by his theory, stimulants are tonics, and tonics stimulants, and that food was both a stimulant and a tonic, and as alcohol, by his doctrine, is both a stimulant and tonic, it must therefore be food.

280. He further muddled the question by saying, "We cannot state with certainty of any food that may not also be a medicine, and a food, under some circumstances.* One of the most deadly poisons is in small doses an excellent tonic, namely, arsenic. Hence, there seems to be a radical difference, and not one of degree, between the effects of large and small doses of alcohol." If arsenic is a tonic, why not use it as a beverage as well as alcohol in small doses, as do the Styrian peasants? Why not also call arsenic a food? Again he said: "So long as there is any need of alcohol in the system, it will fail to intoxicate." This might be applicable to taking a beefsteak, when the stomach is not in a condition to digest solid food, but we fail to see the force of the argument, that the needs of the system will prevent alcohol from intoxicating.

281. It is admitted that in certain doses alcohol is a narcotic. Every mother, however ignorant, who has ever given her child a narcotic, knows that if it be often repeated the dose will have to be increased to produce its narcotic effects.

282. As alcohol lessens the vital powers by narcotizing them, an increase of the narcotic (alcohol) is required to

What was Dr. Anstie's theory, etc.? (279–280). What is said of arsenic, etc.? (280). What of alcohol as a narcotic? (281). What effect has alcohol on the vital powers, and how? (282).

* Stimulants and Narcotics, p. 8. Ibid. p. 714.

arouse the blunted sensibilities resulting from the use of the poison, and not the needs of the system. True to the absurdity of supposing that the system craves or needs alcohol, he says, when "the nervous system, the very centre and basis of the vital functions, has been drained of blood, and exhausted of force, and unless it be quickly restored to its wonted activity, life must cease."

283. To this all will agree; and also, that it would be an act of common sense to administer to the system when "the vital functions have been drained of blood," some of the blood making substances to increase the vital forces. Instead of which, Dr. Anstie said: "Under these circumstances, the rapid absorption of a substance, which, like alcohol, has special proclivity to the nervous system, is precisely the means of reviving the failing circulation in the nervous centres, and upholding the powers of life *i. e.* keeping the machinery going until the body can be supplied with its ordinary nutriment in sufficient quantity to restore the condition of healthy nutrition." Here he plainly admits that alcohol will only keep the machinery going until it can be supplied with ordinary nutriment.

284. Now, if it is food or nutriment, why not continue its use instead of ordinary food? If it will not supply the place of ordinary nutriment, how can it have any claim to be food? If the vital functions have been drained of blood and exhausted of force, why lose time by waiting for alcohol to keep the machinery going? Why not give the proper nutriment at once in the form of hot milk, beef-tea, etc., and not alcohol, which gives no force, but uses up some of the little force that may still remain?

LESSON FIFTEENTH.

ALIMENTARY PRINCIPLES AND ALCOHOL.

285. Every substance capable of nourishing the human system, and entitled to be called a food, as already seen, consists of starch, sugar, fat, albuminous and glutinous

What should be given when the vital functions are drained of blood? (284). What should substances contain to be food? (285).

matters. The blood is the bearer of these nutritious substances to the tissues, to replace their waste.

286. The food, by the various processes of digestion and assimilation, is converted into blood, from which the tissues extract their own proper pabulum to build them up. The blood, as it circulates through the capillaries (Fig. IV-6-14) of the body, yields up to the different tissues the substances needed to take the place of the particles of matter that have become waste and have been eliminated by the excretions.

287. But food has another office to fulfill. It is necessary to health, yea, to life itself, that the heat of the body be maintained at a certain temperature, which, with only very slight variation, is the same night and day, whether active or at rest, in all seasons and in all climates. This heat is generated in the body itself, from the materials in the blood, partly by the combination of the oxygen inspired by the lungs, with certain elements of disintegration; but chiefly in climates like ours by its combination with certain elements of our food. Every substance capable of being employed as food must be either converted into tissue or produce heat.

288. Thus food fulfills the double office of furnishing the blood with substances for the formation of the solid tissues and its fluid secretions, and also with materials to carry on the internal combustion. For just as the vital functions cannot be performed, nor life preserved when the nutritive elements are not supplied, so these functions will fail, and life itself cease, if the heat of the body for any lengthened period be allowed to fall a very few degrees below ninety-eight degrees, Fah., the natural standard.

289. Dr. Pavy classifies foods on the basis of their chemical nature, and divides them into four groups:— *First*, nitrogenous principles. *Second*, hydro-carbons, or fats. *Third*, carbo-hydrates, starch, sugar, etc., and *fourth*, inorganic materials. Dr. Pavy says: "While nitrogenous aliments may be the essential basis of structure, possessing active living properties, the non-nitrogenous principles may be looked upon as supplying the source of power.

By what is the system nourished? (286). What is necessary to life? (287). How is heat generated? (287). What offices do food fulfil? 288). How does Dr. Pavy divide foods? (289).

The one may be spoken of as holding the position of the instrument of action, while the other (non-nitrogenous) supplies the motive power.

290. Dr. Edmunds defines food as "that which being innocent in relation to tissues of the body, is a digestible, or absorbable substance, that can be oxydized—decomposed in the body, and decomposed in such way as to give up to the body the forces which it contains." This definition of food is clear, concise and logical, and is based upon the chemical and physiological action of a true food; bringing, as the doctor says, the food in its relation to the body into a perfect parallel with fuel in relation to a steam engine. With this logical and philosophical definition in view, let us see if alcohol can be a food in any sense.

291. "It would be difficult," said Dr. Gordon, "to find a more destructive poison than ardent spirits"—dilute alcohol. When Dr. Percy injected two and a half ounces of alcohol into the stomach of a dog, it immediately uttered a loud, plaintive cry, and fell dead at his feet. "Never," said Dr. Percy, "did I see every spark of vitality more instantaneously extinguished." The action of alcohol in this case was like a large dose of prussic acid. Is alcohol innocent in relation to the tissues? Would two ounces, or even two pounds, of the most concentrated food have killed the dog? It is clear, in this case, alcohol acted as a poison. What quantity would have acted as a food? Where or what is the line of demarkation? If it is both a food and a poison, there must be some point where one action ends and the other begins.

292. Do you say with Dr. Anstie, that the needs of the system will decide whether it will act as a food or a poison? How can you tell when the system needs alcohol? If it acts as a poison, the evil will be done; and even if it should act as a food, it is at best a very poor and costly food. We have already seen (p. 38) that one hundred parts of grape sugar—$C_6H_{12}O_6$ and water—H_2O, produce after fermentation, or putrifaction, 50.3 parts of carbonic acid, and 52.7 parts of alcohol, or a total of 103 parts with the water.

Give Dr. Edmund's definition of food? (290). What is the parallel of food? (291). What did Dr. Gordon say? (291), What was Dr. Anstie's notion of the needs of the system? (292). How does sugar compare with alcohol? (292–293).

293. A wayfaring man, even if he be a little foolish, must be satisfied that what is formed by the decomposition or destruction of sugar cannot contain the properties of the sugar. Look at the sugar, a nutritious substance, and compare it with alcohol and you will see an entirely different article. More than one-half of the elements of sugar, which make it a nutrient substance, are lost by being transformed into poisonous *carbonic acid*, and the elements that have combined to form alcohol, we know will destroy life. It is very clear, that if all the elements that are in alcohol were as nutritious as when in the sugar, to say nothing of alcohol, as a poison, it would still, as a nutriment, be less than one-half the value of sugar.

294. Many persons, and even some of the medical profession have a notion that because ale and beer are made from barley they must still contain the nutritious elements or properties of the barley. This may be excusable in persons ignorant of chemistry and its laws of composition and decomposition, and the changes occurring in the process of fermentation. Many of this class of citizens suppose when they drink beer that they are taking the barley in a liquid form.

295. A similar fallacy exists in regard to wine, for as grapes are nutritious, wine must be. This, like the former, is a great delusion. The former delusion has been fostered and more or less increased of late years by the Brewers' Congress, which, year after year, at its annual meeting, adopted resolutions similar to the following:

"*Resolved*, That through our local organizations and personal effort, and means of official organs and the press generally, we will endeavor to influence the public in favor of the use of malt liquors as *wholesome*, *nutritious*, and *absolutely necessary* as *healthful restoratives* without, in any manner or form tending to the injury of persons or property, and therefore not calling for any police regulations."

296. But are malt liquors "*wholesome*, *nutritious* and *absolutely necessary restoratives?*" Let us see how much of the nutrient properties of barley remain in the beer, or how much food material is left in it.

297. By the Brewers' Congress, three bushels of barley make one barrel of thirty-one gallons of beer. If three

What do some suppose of beer, wine, etc.? (294-295). What is said by the Brewers' Congress? (295). Are malt liquors and wine nutritious? 296-297).

bushels, or 156 pounds of barley, make a barrel, or thirty-one gallons, to make one gallon will take 5 1-5 pounds. In making the beer what becomes of these 5 1-5 pounds, or 83 1-5 ounces?

There are lost in malting as malt coons,			20	ounces.
"	"	" mashing as grains, . .	27½	"
"	"	" fermenting, . . .	13¾	".
"	"	" fining as barrel bottoms.	9	"
A total loss, ...			70	ounces.

Thus leaving in a gallon of beer about 13½ ounces of what remains of the barley, being principally gummy extract, worth little or nothing as nutriment. Yet this is the (so-called) nutritious beverage, the "juice of the malt," the liquid bread. This is the Brewers' Congress *wholesome*, *nutritious* and *absolutely necessary* as a *healthful restorative*.

298. Liebig, the German chemist, father of the theory that alcohol is heat-giving food, said: "If a man drank daily eight quarts of the best Bavarian beer, in the course of a year he will have taken into his system the nutritive constituents contained in a five pound loaf of bread." The prodigal swine feeder who would fain have filled his belly with the husks that the swine did eat, had he tried the experiment of living on said husks, would have fed sumptuously, when compared with the man who expects to obtain nutriment from alcoholics, whether in the form of brandy, whisky, or the brewers foaming beverage.

299. Why, you will ask, do persons feel stronger after drinking them if they are not nutritious? They are not stronger. Alcohol cannot give strength; they are deluded by the mocker; for science has verified the truth of the Scripture, that wine (alcohol) is a mocker. If you take beer for strength, you obtain instead a narcotic that irritates, while it destroys the nervous sensibility, and the result is weakness and disease. If you drink to prolong life, you use up the vitality to-day that should serve the system to-morrow, thus you expend both the principal and interest of your vitality, and will the sooner become bankrupt in your constitution.

What did Liebig say of Bavarian beer? (298). What results from beer? (299).

CHAPTER V.

ALCOHOL: AS AUXILIARY FOOD.

LESSON SIXTEENTH.

THE COMPOSITION OF INTOXICATING DRINKS.

300. Malt liquors are composed of water, alcohol, gummy extract of malt, bitter of the hop, and a trace of acetic acid, their proportions differing slightly in the various kinds. Alcohol is the essential ingredient in all the varieties of malt liquors and other intoxicating beverages. If you take a pint of ale or porter, weighing eighteen ounces, and put into a retort and apply gentle heat to it, one or two ounces of alcohol will be driven off. By increasing the heat the remaining water, perhaps about fifteen ounces, can be evaporated, leaving behind about an ounce of black, gummy extract of malt or barley. This black, gummy extract is all the nutriment that a pint of ale or beer contains; the sum total of all that can nourish the body in the foaming lager beer and ale, the so-called nutritious beverages.

301. By analysis, the liquors named contain as follows:

Name.	Whisky.	Wine.	Porter.	Ale.	Beer.	Ounces in a pint of Beer.
Alcohol,	28 to 55	14 to 23	3.00	5.85	4.00	$1\frac{3}{4}$
Extract,			6.09	5.00	5.66	$1\frac{1}{4}$
Acetic acid,			0.21	0.15	.17	a trace
Water,	72 to 45	86 to 76	90.70	89.00	90.17	15.00
Total,	100 100	100 100	100.00	100.00	100.00	18 ozs.

It is very evident from the analysis of alcoholic compounds that, if they have any claim as foods, they are very poor as well as dangerous.

Of what are malt liquors composed? (300). Give the alcoholic per cent. in various beverages? (301).

Prof. J. Chandler, of the School of Mines of Columbia College, in 1869, chemically tested five samples of lager beer, of different manufacturers, with the following surmised results:

No.	Specific Gravity.	Water.	Alcohol, by Volume.	Extract of Malt and Hops.
1.	1.008	90.75	6.25	3.00
2.	1.006	89.98	4.99	5.03
3.	1.008	91.59	5.39	3.02
4.	1.018	89.61	4.99	5.40
5.	1.005	87.16	7.79	5.10
Average	1.013	89.82	5.86	4.32

All the specimens contained small quantities of *grape sugar*, of *cripuline*, the bitter principle of hops, a trace of *acetic acid*, produced by the oxydization of some of the alcohol; and of *carbonic acid*, generated during the fermentation.

302. Some of the advocates that alcohol is both a food and a poison tell us that common salt is an irritant poison in large quantities. Common salt, as seen, (L. XIII) is a proximate principle of the body, and is found in the different solids and fluids; and that its presence is necessary and important. This cannot be said of alcohol, which has never been found as a constituent of any animal or vegetable body; nor has it been proved that the system needs it. While chloride of sodium (common salt) excites the digestive fluids and aids in the solution of food, alcohol prevents digestion: *first*, by hardening the food and coagulating the albumen; and *second*, by destroying the solvent power of the *pepsine*, the organic principle of the gastric juice.

303. It has also been said that the acid of the lemon is a poison in large doses, and that the air we breathe contains poison and would not be a vitalizer without its poisonous

What has been said of common salt, etc.? (302). What of *air* containing poison? (303).

properties. The Creator has adapted everything for its proper use, and has endowed man with reason and judgment to choose between the good and the bad, the right and wrong use of all good things, and to avoid the injurious and evil. It is man who changes God's good gifts into evil things, and His blessings into curses.

304. Lemon juice, if used at proper times and in proper quantities, is not a poison, but a blessing in health and disease. Oxygen and nitrogen, as mixed in the air, are life-giving in every breath. If men separate and use them, they must suffer the consequences that may follow their rashness or ignorance.

305. The same reasoning will apply to the use of prussic acid and other vegetable or mineral poisons. The poison of yellow fever does not prostrate at once, every one who breathes it, yet it would not be wise, on that account, for every one to try the experiment of how much of the poison he could bear without becoming prostrated. Our Good Father, it is true, "made the air, the sea and the land." But Our Good Father did not make alcohol, which is the offspring of putrifaction or rottenness, the destruction of His *good gifts*. It is twin-born with that other fatal poison—*carbonic acid*. Why not also call *it* a food? Each is brought into existence by the destruction of food in the process of *vinous fermentation*.

306. The poison of the deadly *malaria* is just as much a production of God as alcohol, and we ought, by the same logic, breathe the *malarial* poison, and call it food; and with just as much reason and propriety can we ask God's blessing on its use as upon the use of wine and other intoxicating beverages.

What of lemon juice? (304). What of oxygen and nitrogen? (304). What of mineral and vegetable poisons? (305). Is alcohol found in nature as a good gift of God? (305).

LESSON SEVENTEENTH.

THE INJURIOUS EFFECTS OF MALT LIQUORS.

307. As already seen (L. XIII), food, to be able to build up the system, must be digested and absorbed into the blood, and to accomplish this the food must be mixed with the secretions of the alimentary canal. The albuminous substances, the sources of animal tissues, are hardened by the action of alcohol, which prevents their transformation into fibrine, etc., and thus interferes with the proper renewal of the animal structures.

308. The attraction of alcohol for water causes it to abstract water from the tissues. This is one of the modes by which alcohol disturbs the functions of digestion and secretions. The salivary glands are deprived of some of their moisture, as are also the juices of the stomach, and the other digestive fluids. The result of this action is irritation, inflammation, and ulceration.

309. Alcoholic drinks do not quench the natural desire for fluids as does simple water, "who is too weak to be a sinner;" but produces an artificial and unnatural thirst, as known by all who have used them, even in small doses. Alcohol also tends to depress the plastic powers of the blood, and prevents the nutritive processes. It so deteriorates the vital forces that very slight physical injuries to persons using them are never cured with the same ease as are persons who totally abstain from alcohol.

310. "A copious London beer-drinker," said Dr. Grinrod, "is all one vital part, he wears his heart upon his sleeve bare to a death-wound from the claw of a cat, or a rusty nail." Every medical man in London dreads a beer-drinker for a patient. "Among the coal-whippers brought to the London Hospital," said Dr. Gordon, "the mortality is fearful." They drink large quantities of ale, etc.

311. Dr. Edwards said: "The diseases of beer-drinkers are always of a dangerous character; they can never undergo the most trifling operation with the security of the temperate."

How do malt liquors interfere with alimentation? (307). What effect has alcohol on water in the body? (308). What is caused by this action? (309). What effect has alcohol on the blood, etc., etc.? (309). What is said of beer drinkers? (310–311).

312. Will the advocates of the food-power of alcohol please to show by what wondrous alchemy it can repair and nourish the system, when it so destroys its vitality that those who habitually use alcoholic drinks are unable to resist the effects of disease equal with those who abstain from them? Food repairs the wear and tear of the body, alcohol cannot. There is no proof that alcohol is decomposed within the animal body, but there *is* evidence that it leaves the body the same compound. It enters the body as alcohol, and it leaves it as alcohol. It does not act in the body like starch, sugar, or fat, though it is claimed to belong to the same class. If alcohol were found in nature like starch, sugars, and fats, and possessed the same number and arrangement of the elements, its advocates might have a shadow of reason for the doctrine that alcohol might serve as food.

313. Alcohol cannot form one particle of tissue, as it contains none of the ingredients of the tissues. The animal economy repels it as an intruder—a foreign enemy. Even Liebig declares "that beer, wine, and spirits, contain no element capable of entering into the composition of the blood, muscular fibre, or any part which is the vital principle." "Alcohol is not a true food," says Dr. Markham, "it interferes with alimentation."

314. A Substance, to act as a true food, must undergo a chemical or vital change, and become a part of the organism, or produce heat and force. As far as our knowledge extends, alcohol undergoes no such change, and, therefore, cannot add a particle of matter to the tissues; and hence, is not a food. Its only known effects while in the system is that of an irritant to every tissue and organ.

315. Dr. Sewell said: "Alcohol is a poison, ever at war with man's nature; and in all its forms and degrees of strength produces irritation of the stomach, which is liable to result in inflammation, ulceration, mortification, a thickening and induration of its coats, and finally *scirrhus*, cancer, and other organic affections. No one who indulges habitually in alcoholic liquors, whether in the form of wine, or more ardent spirits, possesses a healthy stomach." Now,

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Can alcoholic drinks act as food? (312). Why can they not act as food? (312). Is alcohol retained in the system? (313). What do Liebig and Markham say of alcohol? (313). Is alcohol in any sense a food? (314). What did Dr. Semell say? (315).

is there a single article of food, vegetable or animal known, that produces such effects? Not one. No conscientious physician would recommend as food any other article, however nutritious, whose effects on the stomach are such as Dr. Sewell ascribes to alcohol?

316. More than thirty years ago, two thousand medical men of Great Britain declared, "that perfect health is compatible with total abstinence from all intoxicating drinks. That total and universal abstinence from these drinks would contribute to the health, prosperity, morality and happiness of the human race." Nothing in the declaration of these two thousand physicians, indicate that alcoholics are foods in any sense, but to the contrary. Dr. Charles A. Cameron, Professor of Hygiene, in the Royal College of Surgeons, in Ireland, said; "That alcohol is incapable of forming any part of the body is admitted by all physiologists. It cannot be converted into brain, nerve, muscle, or blood. As an ordinary food, alcohol is extremely costly, and it is one which is not necessary in the case of healthy persons; unless used very moderately, it injures digestion and depresses the vital powers." Prof. Lehmann says, in his Physiological Chemistry: "We cannot believe that alcohol, theine, etc., which produces such powerful reaction on the nervous system, belong to the class of substances capable of contributing toward the maintenance of the vital functions." Prof. Moleschott, of Erlanger, said: "Alcohol does not effect the direct restitution, nor deserves the name of an alimentary principle."

317. From these facts and testimonies of the nature of alcohol, we must conclude that alcohol does not contain any of the constituents of the body; hence, cannot build it up. It contains no phosphate of lime, iron, salts of the blood, gluten, nor albumen, the basis of living bodies.

318. The following will prove that alcohol is not food:

First. Food nourishes and warms the body; alcohol does not.

Second. Food is digested; alcohol is not; at least there is no proof.

Third. Food builds up the body by assimilating with the tissues; alcohol never does.

What did 2,000 English physicians say? (316). What did Dr. Cameron say? (316). What are the facts as to alcohol being a food? (317). In what do alcohol and food differ? (318).

Fourth. Food makes blood; alcohol does not, it only mixes itself with the fluids and irritates the tissues and destroys the plastic powers of the blood.

Fifth. Food feeds or improves the blood globules, or cells; alcohol destroys them.

Sixth. Food produces healthy normal action of all the functions of the animal organism; alcohol always tends to produce disease.

Seventh. Food gives force and power; alcohol destroys force and vitality, excites reaction, and reduces the normal powers of the whole system.

LESSON EIGHTEENTH.

IS ALCOHOL RESPIRATORY FOOD?

319. As already seen (p. 193) there are two kinds of blood —the arterial, bright scarlet, and the venus, dark purple. The dark, or venus blood, cannot supply the organism with nutrition, but is a poison in the fullest sense of the term. One of the chief objects of respiration is to get rid of this poison and change the venus blood into arterial.

320. Pure atmospheric air contains about twenty-one per cent. of oxygen, and seventy-nine per cent. of nitrogen. After the air has passed through the lungs, it is changed: 1st, it has lost oxygen; 2d, it has gained carbonic acid; and 3d, it has absorbed watery vapor.

321. The blood in passing through the lungs becomes also changed (see Fig. IV-6): 1st, its color is changed from dark purple to bright scarlet; 2d, it has absorbed oxygen: 3d, it has given off carbonic acid and watery vapor. The carbonic acid in the blood is the product of the decomposition of the organic ingredients of the tissue.

322. The chief object of respiration is to eliminate carbonic acid from the blood, and to supply the blood and tissues with oxygen, which is absorbed during respiration, and passes off in a free state with the arterial blood. The arterial blood may, therefore, be considered as a

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Describe the two kinds of blood? (319). What takes place during respiration? (320). What are the objects and needs of respiration? (322-323).

medium to convey oxygen to the tissues to form a part of them.

323. The venus blood must be purified, or, in other words, changed to arterial, or death takes place almost instantly. Therefore, whatever interferes with its purification will seriously disturb the healthy normal actions of the organism, and the preservation of its existence.

324. What are the effects of alcohol? Liebig says: "The oxygen of the arterial blood, which in the absence of alcohol would have combined with the matter of the tissues, now combines with the elements of the alcohol. (?) The arterial blood becomes venus, without the substance of the muscles having any share in the transformation."

325. Thus, alcohol cannot, be respiratory food: for, by Liebig's own showing, it actually prevents the natural and necessary changes that should take place in the blood during respiration; and thus, instead of aiding in the elimination of the waste and effete matter, it adds more poisonous carbonic acid to the blood.

326. Alcohol is, therefore, a poison, and not in any sense respiratory food. It is impossible that a substance can aid to sustain health and life which adds to the blood a poison like carbonic acid.

ALCOHOL AS A HEAT GENERATOR.

327. Though food must warm the body as well as build up its tissues, we do not believe in Liebig's doctrine, that albumen and its cognates are merely builders; and that starch, sugar, fats, etc., are the only heat producers; nor do we believe that alcohol is a heat-producing food.

328. Many, if not all modern physiologists doubt that starch, sugar, or fats, (non-nitrogenous aliments) should be classed as only respiratory or heat-giving food, and the nitrogenous alimentary principles simply tissue-formers.

329. Liebig taught that nitrogenous matter alone was the source of nervous and muscular power; and that the tissues are consumed in the exercise of functional activity; and that fresh nitrogenous matter was needed to replace that consumed in the production of motor power, or work.

How does alcohol affect arterial blood, etc.? (324-325-326). What of starches as heat producers? (327). Ought starch, etc., be classed as heat producers? (328). What was Liebig's theory? (329).

330. It is now an established fact, that force, or what produces work, is not due to the destruction of nitrogenous tissue, but to the oxydation or decomposition of non-nitrogenous matter; the muscles, etc., merely serving as mediums for the conversion of the generated force into motor power.

331. It has been shown by the experiments of Fick, Professor of Physiology, and Wislicenus, Professor of Chemistry, of Zurich; and by those of Professor Frankland and Dr. Parkes, that a greater or less proportion of nitrogenous matter ingested undergoes metamorphosis, attended by the production of *urea;* but the precise seat of the metamorphosis is little more than surmise.

332. The conclusion is that muscular work is not accompanied by the increased elimination of nitrogen, to be expected, if the work resulted from the oxydation or decomposition of the tissues of the muscles or organs employed; and further, that the force produced, in all cases, is in proportion to the chemical action, and to the amount of oxygen consumed in the process of the complete oxydation of the different articles of food. And while nitrogenous matter may be regarded as forming the basis of structure possessing active living properties, the non-nitrogenous aliments, starch, sugar, fat, etc., supply the source of work. The former holding the position of the instruments of action, while the latter supply the motive power.

333. Though nitrogenous alimentary substances may, by oxydation, contribute to the production of moving force, yet *there is evidence* that it is split up into two distinct portions, one containing nitrogen, and eliminated as useless in the form of *urea;* and a non-nitrogenous portion that is retained and utilized in the production of force, and applied to tissue formation.

334. Thus, while heat and force may be generated by non-nitrogenous substances —starch, sugar, fats, etc.—or as produced by coal in a stove, or oil in a lamp, yet heat and force may be produced by other alimentary substances, as albumen, etc.

335. The capacity of a material for heat production chiefly depends on the amount of unoxydized carbon and

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What is now admitted to be the source of work? (330). What do the experiments of Fick and others seem to establish? (331-332-333-334). On what does the production of heat depend? (335).

hydrogen it contains. Hence, fats and oils hold the highest place as heat-producers.

336. The starchy and saccharine substances contain oxygen sufficient to oxydize all the hydrogen to form water, leaving only the carbon in an unoxydizable condition; while in the fats there is not only carbon, but also hydrogen in an unoxydized state.

337. The relative value of sugar, starch, and fats, and their capacity for oxydation, will be seen by comparing by their formula—starch, $C_6H_{10}O_5$; sugar, $C_6H_{12}O_6$. The hydrogen and oxygen exists in exact proportion to form water—H_2O; while the fats are represented by the formulæ $C_{10}H_{18}O$, in which only two atoms of hydrogen have their combining equivalent of oxygen; the remaining sixteen atoms of hydrogen and the ten atoms of carbon being in a free state for oxydation.

338. Fat, in the process of its complete oxydation, will appropriate two and four-tenths times as much oxygen as starch, or will develop two and four-tenths times as much heat; hence fat is nearly two and a half times the value of sugar as a heat-producer.

339. Matter can neither be created nor destroyed; the same is true of force; but force may be transmitted from one form to another; from chemical energy to heat, mechanical power, etc. This occurs in the living body as in the world around. Modern physiologists not only refer the chief source of heat in the living body to the oxydation of carbon and hydrogen, but to the same source ascribe the production of mechanical work, and that the energy set free by chemical action shows itself as mechanical work. Frick and Wislicenus suggest that a bundle of muscular fibres is a kind of a machine consisting of albuminous materials; just as a steam engine is made of steel, iron, brass, etc. As in the steam-engine coal is burned to produce force, in the muscular machine fats, starch, and sugar are burned for the same purpose.

340. And as the constructive materials of the steam-engine (iron, etc.,) are worn away and oxydized, the constructive materials of the muscles are worn away; and this wearing is the source of the nitrogenous constituents of the

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What is the relative proportion of oxygen and hydrogen in starch, sugar, etc., ? (336–337). What is the relative proportion of heat producable by fat, starch, etc.? (338). What of matter, force, etc., mechanical work? (339). How are muscles, etc., compared to an engine? (340).

urine. Later experimenters found that during muscular exertion, the excretion of *urea*—the nitrogenous constituent of the urine—is little, if at all increased, while the carbonic acid is enormously augmented.

341. Thus, the results of modern scientific research indicate that the non-nitrogenous aliments produce *heat* and other kinds of *force;* and that nitrogenous matter constitutes the basis of the various tissues and organs, and forms the instrument of action; and not as taught by Liebig, that non-nitrogenous matters were simply heat-producers; and that nitrogenous tissues are consumed in functional activity; and that the destruction of nitrogenous matter was the only source of muscular and nervous power.

LESSON NINETEENTH.

DOES ALCOHOL PRODUCE HEAT?

342. Alcohol is not a heat-producer; does not act as a fuel-food in the animal economy like fat, starch, and sugar. As alcohol contains hydrogen and carbon in common with starch, sugar, and fat, it was thought that like them it must act as a fuel-food.

343. Alcohol, it is true, contains hydrogen and carbon, but what of that? They are also constituents of the most deadly and corrosive poisons and mineral acids, as well as of nutritious substances. It is true, that when first taken, alcohol appears to give warmth; but it is of short duration, when the temperature falls and the system is not able to resist the effects of cold. The flush on the cheek after taking spirits, etc., is an indication that all parts of the vascular system—the heart, lungs, brain, etc., are all surcharged with blood or congested, as seen (L. XI).

344. This increase of the temperature of the surface is nothing more than radiation of heat from an enlarged surface of blood; it is a process of rapid cooling. Doctor Richardson found that alcohol and cold placed side by side,

What conclusions may we draw from scientific research, in regard to heat, force, etc.? (341). Why is alcohol conceived to be a heat-producer? (342). What is the first result of alcohol in relation to heat? (343). Is it permanent? 343). Give the cause of the apparent increase of heat? (344) Is it an increase or loss of heat, and why? (344).

ran together equally to fatal effects. In death, from alcohol, he found that the reduction of temperature was one of the most pressing causes of death. The flush or radiation caused by alcohol as seen (L.XI) results from its paralyzing effects on the terminal nerves of the blood-vessels, which regulate their power of contraction and relaxation, and that the nerves having less control over the small vessels, a larger quantity of blood is exposed to the air, when there is a rapid cooling and a reduction of the animal temperature.

345. These experimental observations are fully corroborated by the experiences of all the American and English navigators to the Polar regions—Ross, Parry, Franklin, Kane, and others. It has been clearly demonstrated, that in the higher latitudes, where all the powers of life are required to oppose the destructive forces of nature, alcohol is most pernicious.

346. Alcohol is a depressant, and as such, tends to lower vitality, and depress the powers of the system to generate heat. Therefore, to be able to resist the effects of cold, all alcoholic beverages must be avoided.

347. Sir John Richardson, M. D., of the English Arctic Expedition, said: "I am quite satisfied that spirituous liquors diminish the power of resisting cold. Plenty of food and sound digestion are the best sources of heat. We found on our Northern journey that tea was far more refreshing than wine or spirits."

348. The Hudson Bay Company have for many years entirely excluded spirits from the fur countries of the North, to the great improvement of the health and morals of the Indian tribes, and their Canadian servants.

349. Dr. McRae said: "The moment that a man had swallowed a drink of spirits it was certain his day's work was nearly at an end. It was absolutely necessary that the rule of total abstinence should be rigidly enforced, if we would accomplish our day's work. Whatever it could do for a sick man, its use as a beverage, when we had work on hand in that terrific cold, was out of the question."

350. The Red River (of the North) Expedition is another instance in which the benefits of total abstinence is

What confirm these conclusions? (345). What does Sir John Richardson say? (347). Give the experience of the Hudson Bay Company? (348). What said Dr. Rae? (349.) What is said of the Red River (of the North) Expeditionn ? (350).

shown. These men were constantly wet through, sometimes for days together, yet they were always cheerful and never seemed to feel the absence of spirits. Capt. G. S. Huyshe considers this experiment of an expedition, without the issue of spirit ration, an unequivocal success; and says of the soldiers, "up early, hard at work all day rowing or portaging from 5 A. M. to 8 P. M., with short intervals for breakfast and dinner; nothing to eat but salt pork and biscuit; nothing to drink but tea; yet looked as healthy as possible, and when they reached Fort Francis there was not a sick man amongst them. They had no time to be sick. The men admitted the superiority of tea as a substitute for spirits."

351. Nor is the evidence that alcohol is not a fuel-food confined to these experiences. Science has confirmed them by the experiments of Dr. Richardson and many others. Dr. Prout, more than fifty years ago, showed by his experiments that alcohol diminished the quantity of *carbonic acid* exhaled. If alcohol prevents the elimination of carbonic acid, it cannot produce heat. Its effects are the same as closing the damper of a stove, which does not increase heat, but prevents its generation. Whatever alcohol may do, it certainly does *not produce* heat.

352. It has also been shown by Dr. Hammond that the temperature is lowered by alcohol. Dr. Franz Riegel, in eighty-six experiments upon men, arrived at the following conclusion: 1st. Alcohol, even in moderate doses, lowers the temperature. 2d. That only in exceptional cases is the temperature elevated—this change is frequently observed after small doses. 3d. The decrease is less in convalescents than in healthy persons, or altogether unnoticed. 4th. In those who habitually use alcohol their depressing influence is wanting. 5th. The frequent repetition of the doses diminish their lowering effects on the temperature. 6th. The diminishing of the temperature is directly in proportion to the dose. 7th. Duration of the depression of the temperature is, for the most part, short, when the temperature returns to its previous grade.

353. Dr. Binz made forty-seven experiments, and said: "We started with the conviction that the stimulating

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What did Dr. Prout show? (351). What did Dr. Hammond show? (352). What did Dr. Franz Riegel show? (352). What said Dr. Binz? (353).

influence of alcohol was indubitable on the vital properties of the juices. * * But the results are not in accordance with that view. Half a glass of light hock, or a small glass of cognac, caused a fall of 0.4° to 0.6° (or two-tenths of a deg.) in a very short time. Large doses given to a dog reduced the temperature in 2¾ hours from 38.4° to 36.7°, C. While it raised the pulse from 99 to 118.

354. According to Liebig, if 100 parts of fat or oil, by its combustion, produce a certain amount of heat, it would require 240 pounds of starch, 249 parts of sugar, and 260 parts of alcohol, to give the same amount of heat. By this estimated value of alcohol, as a heat-producer, it is certainly a very poor one; for a pound of fat is equal to three or four pints of whisky, as shown by the author of the doctrine that alcohol is fuel-food. This estimate is of alcohol burnt outside of the body. (See Experiments of Dujardin-Beaumetz and Audige, L. VII). Before leaving this branch of the subject, we will report another and more recent triumph of the principles of total abstinence. This occurred during the late English Arctic Expedition. Among the crews, there was a number of noble fellows, who dared to meet the icy rigors of the North Pole in the well-tried armor of total abstinence. The total abstainers were six: William Malley, Adam Ayles, William Gore, Joiner and Self, of the ship Alert; and Henry Petty, of the ship Discovery. Ayles, Malley, Gore and Petty were Good Templars, and all except Core were true to their colors to the end. Joiner had been a total abstainer for eighteen years, and SELF for twenty-one years, but neither were Good Templars. Both took drink during the toilsome sledge journeys. The only men in the Alert that did sledge work worthy of remark, were Malley, Ayles, Joiner and Self; the rest of the crew, including Gore, were severely punished for their drinking, all having suffered disease and exhaustion.

356. When the sledging work closed, at the end of July, it was found that the abstainers on the Alert had surpassed the remainder of the crew in the number of days sledging performed. Malley had been out ninety-eight days, and Ayles one hundred and ten days.

What comparison did Liebig make? (354). What was proved during the late English Arctic Expedition? (355-356-357-358).

357. It is a fact worthy of note, that neither of these men were attacked with scurvy, but enjoyed good health, being only weakened by their arduous duties in sledging, which is said to be the hardest work ever imposed on man.

358. Ayles not only did one hundred and ten days sledging, but on one occasion, was out of the ship for eighty-four days, and this often in the severest and most extreme cold. One time the temperature was 104° below frost, or 72° below zero. Ayles at one time was with Commander Aldrich, when five of the men were struck down with scurvy; and he, with Mr. Aldrich, only left to drag them back to the ship. The officer said: "Ayles, for God's sake, take some spirits, or we shall all be lost." "No," said Ayles, "I promised my mother, when a boy, never to touch it, and if I perish in the ice, I will keep my word." He did keep his word, and never suffered from frost-bite, scurvy, or other sickness.

359. Another fact worthy of being remembered is this: Each man had a design painted on canvas upon his back, to attract the attention of those following in order to prevent snow-blindness. The Good Templars had the Grand Lodge Seal of the I. O. G. T. painted on theirs. It was agreed that he who went the farthest should leave his behind. Adam Ayles accomplished this feat, and buried the Good Templars' seal in a cavern nearer the North Pole than any other human being has yet gone. All honor and glory to Bro. Adam Ayles and Good Templary.

360. It is a physiological law, or law of life, that the elevation of temperature is accompanied with increased activity of the nutritive processes, and that carbonic acid, perspiration, and other excretions, are increased.

361. By the experiments of Drs. Prout, Richardson, Smith, Riegal, Renz, Hammond, and others, the elimination of carbonic acid is diminished, and the temperature lowered, by the use of alcohol, it cannot therefore be a fuel-food, and warm the body. Capt. Sir Edward Parry said, more than forty years ago, in answer to the question:— "Are ardent spirits necessary?" "I say, decidedly, NOT. It is said they keep the cold out. I say they do not; they LET THE COLD IN." This opinion all the latest scientific experimenters have verified.

What is said of the Good Templars' Seal? (359). Is alcohol a fuel-food? (361). What did Capt. Parry say? (361).

CHAPTER V.

ALCOHOL: ITS RELATION TO FORCE.

LESSON TWENTIETH.

DOES FORCE RESULT FROM NITROGENOUS TISSUE?

362. Being unable to sustain its character as a flesh-former, or as a heat-producer, the advocates of alcohol as a food, seized upon Prof. Moleschott's theory: that alcohol, though not a food itself, was a kind of saving-box, making food last longer by preventing the waste of tissue.

363. As alcohol retards molecular activity, by narcotizing the nerve forces, there is less activity, less waste, and less food needed; as Dr. Beale says, "it cuts short the life of rapidly growing cells, or causes them to live more slowly." This is really all that can be understood by the theory that "alcohol saves tissue." This theory had formerly numerous advocates, and as the tissue-saving power of alcohol is still taught by some in the medical profession, it is deemed necessary that its claims should be examined.

364. In the City of New York, as lately as May 4th, 1874, at an august medical assembly, the doctrine that alcohol saves tissue was advocated by a very learned professor, whom I most highly esteem for his medical ability, and whose opinions on most medical subjects would have great weight on my mind. As I desire to deal only with his doctrine, I shall call him Doctor, or Dr. H., and examine it as expounded by him.

365. The learned doctor said: "We know that a certain amount of tissue is decomposed with every functional action of the organ to which it belongs. Just as steam results from the combustion of *fuel*, so thought results from the *combustion* of the gray nerve tissue, motion from the

What was Prof. Moleschott's theory? (362). On what was it based? (363). What was D. H.'s theory? (365).

combustion of muscle; and the force to secrete bile from the combustion of the substance of the liver. We know very well that if fresh fuel is not supplied to the engine, from time to time, steam ceases to be formed, and the machinery set in motion by it no longer works. The like is true of the body, and were it not for the formative processes which are continually going on, whereby new material derived from the food is deposited to take the place of that which is consumed, death would very soon result. It must be distinctly understood, however, that ordinary *food does not directly furnish* any *force inherent in the food;* but that it must first be converted into flesh and brain, and heart, etc., from the destruction of which organs, the force peculiar to each is evolved." Again he said:

366. "In science, however, we believe nothing which is not demonstrated, and even then we do so provisionally, with the full understanding, that if to-morrow new facts are brought forward which appear to be inconsistent with those upon which a favorite theory rests, and which are of greater weight, the hypothesis shall be abandoned without hesitation." Let us first examine the hypothesis on which the doctor based his theory.

367. The human system begins to die as soon as it begins to live. Life indeed is the result of the renewal of the tissues, and this renewal cannot be too rapid; for health is the result of their active renewal, while its cessation is death. Whatever interferes with the processes of nutrition, prevents the proper renewal of the tissues, and proportionately impairs the vital forces.

368. Life requires food for the growth and renewal of the tissues, and also matters which shall by chemical, or other transformation, give up the energy or force consumed in life-work.

369. It is also certain that nitrogenous tissues, and nitrogenous secretions, can only be derived from food that contains nitrogen. To this all must agree. But, notwithstanding later scientific researches and demonstrations, the doctor appears to still cling to the exploded Liebigian theory, "that the energy of muscular action is derived from the oxydation of muscle-substance itself, whereby

What is said of science? (366). On what does life depend? (367-368). What is said of nitrogenous secretions? (369).

the latter disintegrates in the work done." Or, as the doctor says, that the food "must first be converted into flesh and brain, and heart, etc, from the destruction of which organs the force peculiar to each is evolved."

370. Is this hypothesis true? If it is, then the nutritive value of a food must be measured by the nitrogen it contains, and Liebig's theory holds good. This being true, *muscular action* is the result of the destruction of muscular tissue. And further, there must be eliminated as a product of this destruction a nitrogen-containing excretion: as compounds that have served their office in the animal organism are discharged from the body.

371. Thus nitrogen that has fulfilled its office in the body is eliminated in the form of *urea;* and the nitrogen excreted as *urea*, is nearly equal to the sum of the nitrogen taken in the food, and may, as Dr. Parkes said, "for all practical purposes represent the whole of the nitrogen."

372. Now if the doctor's or Liebig's theory, be correct, the amount of *urea* must vary with the labor done, and rise and fall as exercise or rest is taken; and also, that the amount of *urea* excreted during exercise should be the measure of the amount of chemical action, which is equivalent to the energy required to do a certain quantity of work.

373. But unfortunately for this theory of Liebig's, and also the doctor's hypothesis, it has not, and we believe, never can be demonstrated. We have already referred (p. 331) to the experiments of Professors Frick and Wislecenus, Frankland and Parkes.

374. By these experiments it was clearly demonstrated that muscular work was not accompanied by the increased elimination of *nitrogen* or *urea* to be looked for, if the work resulted from the oxydation, or decomposition of the tissues of the muscle.

375. These experiments clearly demonstrated that the force expended far exceeded the amount derivable from the nitrogen consumed, and that while nitrogenous matter may be regarded as forming the basis of structure, possessing active living properties, the non-nitrogenous alimentary principles—starch, sugar, fats, etc., supply the

If the Doctor's hypothesis is true, what must take place? (370-371-372) What do experiments show? (373-376).

source of power. The former holding the place of the instrument of action (the engine), the latter supplies the motive power (the fuel).

376. And though nitrogenous matter may, by oxydation, contribute to the generation of moving force, still it is *split up* into two *distinct* parts, one containing nitrogen, which is eliminated (p. 333-34) as useless, and a non-nitrogenous portion, that is retained and utilized in the production of force, and applied to tissue formation.

377. If the muscular tissues be not consumed during exercise, but little or any more than when at rest, the doctor must abandon his favorite theory, for it cannot be demonstrated in "science we cannot believe it."

378. These experiments and facts demonstrate very clearly that the hypothesis on which the doctor's favorite theory is based, cannot stand the test. That force is not produced by the destruction of the organs, by which force peculiar to each is evolved, nor does exercise appear to increase the waste of nitrogenous matter.

379. Force appears to be due to the oxydation of non-nitrogenous matter, the muscles serving merely as a medium for the conversion of the generated force into motor power. A house built upon sand cannot stand, and the doctor's theory of the power of alcohol to preserve tissues must fall, when the foundation or hypothesis which it rests upon cannot be demonstrated.

380. If tissues are not wasted by labor, as was formerly supposed it is very certain that alcohol cannot prevent the waste of tissues during labor.

381. It is very evident from the experiments referred to, that it is not entirely due to the combustion of the tissues of the brain, heart, liver, etc., that the force peculiar to each is evolved; but rather that much, if not all the force generated by each organ is derived from the elements of the food, which undergoes, in each organ a peculiar catalytic transformation, and thus is force peculiar to each organ produced.

What must the doctor do? (377). Is force the result of tissue destruction, or food? (378-379). What is the probable origin of the force evolved by the different organs? (381).

LESSON TWENTY-FIRST.

DOES ALCOHOL SAVE TISSUE?

382. "Let us suppose," says Dr. H., "that a workman laboring twelve hours a day upon a diet of ten ounces of meat and sixteen ounces of bread, finds that he loses weight at the rate of one ounce a day.

383. "Now in order to preserve his health, and perhaps even his life he must either take more food, or lessen the waste of his tissues. MEAT and BREAD are *expensive*, and he *finds* it *difficult* to *obtain them;* or what is not at all improbable, the quantity he eats is as much as he has any appetite for, or can digest; the alternative presented to him is to work less."

384. As already seen, the tissues are not wasted by exercise to any great extent; therefore, to labor less will not prevent the waste of tissues; hence, some other means will have to be adopted to save them. This, according to the doctor's hypothesis, can be done by the man taking a mug of porter, or a glass of wine, or, what would be worse, a dram of whisky after his midday meal.

385. The result of which, the doctor says, "he is pleasantly exhilarated, his vigor is increased, (?) and he labors to the close of his task contentedly; and when it is concluded, he is more cheerful, and less fatigued, etc., (?) and finds he has lost but half an ounce. He repeats his experiments the next day, like results follow, and when he weighs himself, finds that he has lost nothing.

386. The inference, therefore, is that the beverage he imbibed retarded the destruction of his tissues, or, has itself, aided in supplying material for the development of force expended in his labor. Oh, marvelous beverage! O, wonderful and sage conclusion!

387. To further impress his hearers with the power of alcohol to save tissues, he says, "Dr. Prout ascertained, that after the use of alcohol, the amount of carbonic acid excreted by the lungs was considerably reduced."

388. Let us examine this hypothetical case. The man

What argument does the doctor offer that alcohol saves tissue? (383-384-385). What inference is drawn? (386). What did Dr. Prout ascertain? (387).

"lost an ounce a day," and to prevent this waste he must eat more, or work less, or take something. Then we are told the man, not being his own master, cannot work less; and that bread and meat being *expensive*, *finds* it *difficult* to *obtain them*, so he takes a mug of porter, and he has held his own or gained an ounce a day.

389. A query arises just here, as to whether the increase of weight was due to tissue saved or the increase of nutriment taken?

390. If the latter, the man certainly paid dear for his nutriment, though "bread and meat," it is said, "are expensive." Leibig says (Letters on Chemistry): "We can prove with mathematical certainty, that as much flour as can lie on the point of a table-knife is more nutritious than eight quarts of the best Bavarian beer; and a person who is able daily to consume that amount of beer obtains from it, in a whole year, in the most favorable case, exactly this amount of nutritive constituents which is contained in a five pound loaf, or three pounds of flesh." If Bavarian beer contains the alcoholic percentage, and the nutriment of porter, to obtain the nourishment contained in a five pound loaf, or three pounds of flesh meat, he must drink 5,840 mugs or pints of porter, which at five cents a mug, will cost $292.00, while the bread and meat, which is so *expensive*, and so *difficult* to obtain, would cost, at the highest rate, the enormous sum of thirty cents for the bread, or sixty cents for the flesh meat, to supply the materials for the development of the force expended in his labor, or obtained from porter.

391. By Dr. Frankland's experiments on weight and cost of the various articles of food required to be consumed to raise the body of a person weighing 140 pounds to the height of 10,000 feet, it was found that 9½ cents worth of bread, or 11 cents worth of beef fat, will give as much force as nine bottles of Bass' pale ale, costing $1.87, or 6⅓ bottles of Guinness' stout, costing $1.40.

392. Wonderful economy! What a prodigious saving-box alcohol must be! If it saves tissues as it saves money, it is needful that mankind should learn its saving virtues,

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What would the nutriment in the porter cost? (390). What do Dr. Frankland's experiments show? (391).

and that most speedily. So much for the economy of porter *versus* bread and meat.

393. Then again, admitting the doctor's theory to be correct, how does alcohol give force, and at the same time retard the waste of tissue? By the doctor's theory, the combustion of tissue must take place to produce force. "Thought," he said, "results from the combustion of the gray nerve tissue; motion from the combustion of muscle," etc. If the combustion of tissue produces force, how can force be produced when the combustion of tissue is retarded? Let the doctor and others who believe in the doctrine escape from the dilemma.

394. As the doctor truly said, "In science we believe nothing which is not demonstrated," we will, therefore, examine what scientific experiments *have* demonstrated as to the *effects* of *alcohol* and *exercise on the body*.

LESSON TWENTY-SECOND.

ALCOHOL AND EXERCISE.

395. In 1872, experiments were instituted by the late Drs. Parkes and Count Wallowicz, to ascertain how far exercise increased the elimination of nitrogen, and whether this was affected by the use of alcohol; and further, if exercise increased the elimination of nitrogen, whether it was derived from the food, or from the disintegration of the tissues of the body.

396. For these experiments, a steady, temperate, and healthy soldier, aged thirty years, was selected. As the man was a Scotchman, it was decided that he should live on oatmeal, water and milk.

397. It was found after some inquiry, that twenty-eight ounces of oatmeal and two pints of milk daily, were necessary. On this diet he subsisted and maintained his health for sixteen days. The quantity of water he drank

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Point out the absurdity of the doctor's theory? (393). What was the object of Drs. Parkes' and Wallowicz's experiments? (395). Who was chosen for them? (396). What diet did he use? (397).

daily, including that in the milk, was 135 fluid ounces. In addition, he took brandy for experiment on certain days.

398. The experiments were conducted as follows: For six days he rested, only walking enough to keep him in health. Then he worked three days hard at digging from eight to nine hours daily. He worked as hard as he could, making the labor as uniform as possible each day. He then rested for three days. He then worked at digging for three days, during which he took twelve fluid ounces of brandy, containing 5.4 fluid ounces of absolute alcohol, in doses of four ounces each, at ten, two and six o'clock.

399. After which he rested three days. On all these days the condition of the man, during rest and exercise, was carefully ascertained. He was accurately weighed every morning. The excretions were daily analyzed, and the exact amount of nitrogen eliminated recorded. The pulse was taken every two hours, after the man had been in a recumbent position for fifteen minutes. The temperature of the body was taken nine times a day, at intervals of two hours.

400. The elimination of alcohol was also tested, and the effect of the brandy on the man's power to labor watched.

401. The average daily excretion in grains of nitrogen, during each period, was as follows:

1. Rest, ...	293 3-5	grains.
2. Exercise, on water, ...	329½	"
3. Rest, ...	296	"
4. Exercise, on brandy, . . .	311 9-10	"
5. Rest, ...	282½	"

402. For the whole period the total daily average of the nitrogen discharged was 302½ grains against 310, being a loss in the sixteen days of one hundred and eight grains.

403. As in the former experiments it was found that the brandy deranged the action of the heart, and caused it to perform an unnecessary amount of work, which, in the case of this man, in the brandy period, was a daily increase of 6,552 pulsations of the heart over the exercise period with water.

404. The experiments in reference to alcoholic elimination show, that before the brandy, nothing passed off by

How were the experiments conducted? (398-399-400). How many grains of nitrogen eliminated at each period? (401). What were the effects on the heart, etc.? (403). What of the elimination of alcohol? (404).

the skin, lungs, or kidneys, that produced the slightest change on the bi-chromate of potassium test; but after the brandy, a substance that reduced the test passed off by these outlets, especially the skin. Thus clearly showing that alcohol is eliminated.

405. When the man began to take the brandy, he thought that it would give him a kind of spirit to do much more work; but he found he was deceived. When he took the second and third doses their narcotic effects were strongly marked. He felt heavy, and could hardly refrain from giving up his work.

406. At the end of the experiments it was the man's judgment that he could do the work better without the brandy, which corroborates the experience of all who within the last forty years have given total abstinence from alcohol a fair trial.

LESSON TWENTY-THIRD.

DR. PARKES' CONCLUSIONS.

407. From the experiments given in the last lesson, Dr. Parkes arrived at the following:

First. That the elimination of nitrogen during exercise was unaffected by the brandy; that in healthy men, on uniform good diet, alcohol does not interfere with the disintegration of the nitrogenous tissues; or, in other words, does not prevent the waste of tissues.

408. *Second.* The heat of the body was unaffected by the amount given.

409. *Third.* The pulse was increased in frequency, by four ounces of brandy, and palpitation and breathlessness were brought on by larger doses, to such an extent as to lessen the amount of work the man could do, and to render quick movements impossible.

410. As the effects of labor alone is to augment the

What effect had brandy on work? (405). What was the man's opinion? (406). What were Dr. Parkes' conclusions? (407-408)) What of the pulse? (409-410).

strength and frequency of the heart's action, it would appear obviously improper to act on the heart still more by alcohol. It can hardly be supposed that to urge a heart requiring rest, as in this case, can be proper.

411. *Fourth.* The man was of the opinion that four ounces of brandy had no influence on work either way; but the second four ounces, at two o'clock, produced decidedly bad effects.

412. *Fifth.* Neither exercise, on the water, or on the brandy, produced any effect on the elimination of phosphoric acid. The effect on the chlorine was not certain, its ingress not being sufficiently constant, but it seems to be lessened in the exercise period.

413. As the action of alcohol in dietetic doses on the elimination of nitrogen, and on the bodily temperature is entirely negative, it is reasonable to doubt if alcohol can have the depressing effect on the excretion of pulmonary carbon which is commonly attributed to it.

414. Again Dr. Parkes said: "It can hardly *depress*, * * * the *metamorphosis* of *tissues* or *substances furnishing carbon without affecting either* the *changes* of the *nitrogenous structures*, or *bodily heat.* Do not these experiments demonstrate that alcohol does not prevent waste of tissue?

415. The notion that a glass or two of wine at dinner will lessen the wear and tear of body and mind, to the true scientist must appear the very acme of fallacy.

416. According to the doctor's theory, it is by the destruction of tissue that force of any kind is generated, and without the metamorphosis of the substance of the organs, force cannot be evolved or any work done. Yet, we are told that alcohol will retard the destruction of tissue, produce force, and enable a man to perform his labor more easily, which seems very much like the story of the *Kilkenny cats.*

417. The doctor must either abandon his notion, that all force is derived from the destruction of tissue, or the idea that alcohol can *retard waste*, *give force*, *promote health*, *increase* the vigor of body or mind, and enable a person to better endure physical or mental labor.

What was the man's opinion? (411). What is said of the elimination of phosphoric acid, chlorine, etc.? (412). What of alcohol as a dietetic? (413). What of metamorphosis of tissue, etc.? (414).

418. Prof. Hammond, of New York, overleaped himself, and fell on the other side, when he set himself to test the virtues of alcohol as a waste-arrester in the three following ways: "1st, When the weight of the body was kept uniform by a sufficiency of food; 2d, when there was a loss of weight from deficiency of food; and 3d, when it was gaining weight by an excess of food." The use of a certain quantity of alcohol, in the first case, spread over five days, was followed by a slight increase of bodily weight, but with headache, feverishness and general disturbance of health. In the second case, these evil effects, he says, were not felt, and the weight of the body, notwithstanding the deficiency of food, was considerably more than sustained. In the third case, with the use of alcohol and excess of food, the weight was still further increased, but the general health was greatly disordered, there being incessant headache, disturbed sleep, hot skin, pulse averaging ninety-eight per minute, impaired appetite, and other derangements.

419. The experiments ended with violent diarrhœa, of forty-eight hours duration, by which it was evident that the system protested against such absurd treatment of the body; and that the system most unmistakably asserted that such arrest of vital metamorphosis, and saving of tissue, if such it be, is no advantage, but palpable injury.

420. Even if alcohol can spare the tissue, such sparing is but a clogging up of the system, a choking of the vital flame. Nature's law is purity and change. Health and life is the just and proper maintenance of all those changes; and that we daily die to live. To spare the tissue is to arrest vital changes.

421. Dr. Campbell Black says: "It seems to me a remarkable fallacy that physiologists should persist in talking of the propriety of sparing the tissues." Inasmuch as the proper function of the tissue is, to such an extent their destruction, life is the resultant of the change; indeed, when any tissue is unduly retained in the system, it may of itself constitute *materies morbi*.

422. Dr. Jewett aptly put the question from the standpoint that tissues are wasted by exercise. The question

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What of Prof. Hammond's experiments? (418). What were their results? (419). Can tissues be safely spared? (420). What said Dr. C. Black? (421). What said Dr. Charles Jewett? (422).

being asked, "did alcohol in the body prevent the waste of tissue? when he said: "Prevent the waste of tissue! It does, to a certain extent. It stupefies the fellow so that he cannot use his muscles or brain. Wherever you develop power you waste tissue; (?) if you develop thought you waste brain. When the fellow is dead-drunk he saves his tissue. Toads have lived in rocks one hundred years; but who wants to live a toad's life for the sake of saving his tissues? I want to go to my table every day and have it well spread with substantial food, and incorporate the vegetable compounds, and make them a part of a Jewett, and then I want to use up the energy in advancing the glory of God and promoting the good of mankind. This idea of saving tissues is all a humbug."

423. While it may be proper and desirable to prevent the body being worn out too fast by its own energy, it appears to be absurd to arrest or retain in the system the effete products of metamorphosis, which is really all that occurs in taking alcohol. Lallemand, Perrin, and Duroy, and others, found globules of fat swimming in the blood after a single dose of alcohol. Prout found a diminution in the amount of carbonic acid given off after the use of alcoholic drinks?

424. It is, therefore, easy to perceive how the habitual use of alcohol will cause degeneration of the vital fluid, and that the unburned carbon will deposit itself in the form of fat, resulting in fatty degeneration of the tissues of the vital organs; hence, the unhealthy condition of the bodies of the copious beer-drinkers: as Sir William Gull, M. D. F. R. S., said to the House of Lords' Committee, 1877: "I should say, from my experience, that it is the most destructive agent that we are aware of in this country. * * * There is a great deal of injury done to health by the habitual use of wine in their various kinds, and alcohol in its various shapes, even in so-called moderate quantities, * * to people who are not in the least intemperate. * * I think drinking leads to the degeneration of the tissue; it spoils the health, and it spoils the intellect. * * * I would like to say, that a very large number of people in society are dying, day by day, poisoned by alcohol, but

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What were the results of a single dose of alcohol, etc.? (423). What are the results of sparing tissue? (424). What did Dr. Gull say? (Ibid).

not supposed to be poisoned by it. * * * There is disease of the liver, and from the disease of the liver we get disordered condition of the blood, and consequent on that we get disease of the kidneys. We get a diseased nervous system, we get gout, and we get diseased heart; I hardly know any more potent cause of disease than alcohol." On the effects of malt liquors he said:

425. "I can mention what I once saw myself in the case of one of Barclay & Perkins' (brewers) draymen. The man was admitted into Guy's Hospital with heart disease. * * * He was a very stout man; he died at about quarter past ten o'clock at night, about this season of the year (August), and the next day he was so distended with gas in all directions that he was quite a curious sight. Wishing to know what this gas meant, we punctured the skin in many parts and tested it. It was carburetted hydrogen, and I remember lighting on his body fifteen or sixteen gas lights at once. They continued burning until the gas had burned away. * * * That was, no doubt, the carbon and carburetted hydrogen, from those carbon compounds which he had been drinking."

426. The tissues saved, or waste arrested by alcohol, is at the expense of the vital powers, for all the vital organs become more or less degenerated, so that the most trifling accident or disease, which in the total abstainer would be readily overcome, in the users of alcohol, and especially copious beer-drinkers, prove rapidly fatal. As Dr. C. Edwards said, "the whole cellular substance is infiltrated with fluid; they are walking specimens of general dropsy," and though they appear giants in their physical structure, a scratch that a child would not heed has, in this class of persons, often proved fatal. Numerous instances might be given to enforce this point, if needed. Let this fact be impressed on the minds of all, that good food alone can make good tissues, and that alcoholic drinks contain nothing that can form tissues.

What did Dr. Gull say of beer-drinkers? (425). What said Dr. Edwards? (426).

CHAPTER VII.

ALCOHOL: AS A SOLVENT, ETC.

LESSON TWENTY-FOURTH.

ALCOHOL: AS A SOLVENT OF FOOD.

427. Another important question connected with the action of alcohol is its effects on the elements of the food while in the alimentary canal.

428. Alcohol is very useful in the laboratory of the chemist, and for the pharmaceutist, as a solvent of gums, and to extract the medical properties from certain animal and vegetable products. The stomach of the living animal was never intended to be made into a chemist's laboratory.

429. Water is the medium by which, in the living animal, all the vital functions are carried on. No other liquid can act as a solvent of most vegetable substances. This almost universal solvent (water) so bountifully supplied by the Creator, is the only true solvent of food in the living body; the gastric juice, and other digestive fluids secreted in the alimentary canal, are nearly all water.

430. He who drinks any other fluid and expects by so doing to aid digestion, or other nutritive processes, deceives himself, thwarts God's designs, violates the laws of health and life, and must suffer the penalty. It needs little reflection to make it evident that water is the only drink designed by the Creator for man's use, as no other so well quenches the thirst, and never increases it; aids to nourish the tissues, but never injures them.

431. Water is so great a necessity, that a healthy adult needs from fifteen hundred to two thousand pints annually. Nor is this quantity too much, when we reflect that four-fifths

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What effect has alcohol on food? (428). What is the office of water? (429-330). What proportion of water in the tissues? (431-432).

of the blood, three-fourths of the brain, nerves, muscles, and semi-solid tissues, is water; and that water is the chief agent of digestion, absorption, nutrition, and secretion, and aids in all the wonderful changes that take place within the animal organism.

432. As water forms so large a proportion of the body, it must certainly play a most important part in sustaining and building up the animal system. We may reasonably conclude that anything which interferes with the natural operations of water in the body, must produce abnormal and injurious results.

433. A necessity for water is sooner felt than for solid food. A person may pass eight, ten, or even twelve hours without solid food, with little inconvenience; but if deprived of water, for a much shorter period, the system will become greatly exhausted, and its want severely felt, as tens of thousands of our soldiers in the late war experienced.

434. Alcohol, when brought in contact with an animal membrane, is at once absorbed and diffused into the tissues. According to Liebig, for every volume of alcohol absorbed by the tissues, three volumes of water are expelled; hence, the effects of alcohol on the colloid of the tissues as already seen (L. VII), and the coagulation of albumen. These effects occur in the living stomach, in a greater or less degree, according to the alcoholic strength of the liquor. This greed for water is one of the ways by which alcohol injures the system. To deprive the tissues of water will inevitably interfere with the proper nutrition of the system, and its normal vital changes.

435. Every physician knows, that after drinking, the mucous membrane of the stomach is more or less congested and inflamed; and those who have had much practice in treating persons suffering from inebriation, have often seen rejected from the stomach large quantities of undigested food that had been taken twelve, or perhaps, twenty-four hours before. In from one to five hours stomach digestion is completed, yet it may require four or five times as long to digest the same articles of food if alcohol is taken

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What is the effect of being deprived of water? (433). What said Liebig of water, and what is the effect of alcohol on the food, etc.? (434). What is the result of taking alcohol during digestion? (435).

during the process of digestion. Hence, alcohol cannot be a solvent of food.

436. The value of water in sustaining the integrity of the system has been most clearly demonstrated by Dr. Tanner's forty days' fast. This is only one of the many cases of persons who have lived for long periods without food. In a few of these cases alcohol, in some form, was given, and the alcoholic beverage received the credit of having prolonged life, when the water was undoubtedly the sustaining agent. It is well known that man, like the hybernating animals, can live on the fat stored up in the system, which is taken up by the absorbents, conveyed to the heart, and mixed with the blood. But in order that this may take place, without greatly disturbing the system, producing fever, delirium, etc., water must be supplied to dilute the saline and alkaline substances. Had Dr. Tanner taken alcoholic drinks, they would have prevented absorption, and as a consequence there would have been inflammation of the alimentary canal, and a more rapid exhaustion of the vital powers.

437. When Dr. Tanner, in the early period of his fast, took no water, there was very great loss of physical power and weight. He lost during the first sixteen days twenty-five pounds, or an average of one and a half pounds a day. He then commenced to drink water freely, and gained one and a half pounds in one day, and weighed on the twentieth day of his fast three pounds more than on the sixteenth. From the twentieth to the twenty-fourth day, he drank thirty ounces of water daily, and lost on an average twelve ounces a day. During the next four days he lost eight ounces a day, and took twenty ounces of water a day. He lost daily, from the twenty-fifth day to the thirty-second, twelve ounces, and drank twelve ounces of water. From the thirty-second to the thirty-sixth day he lost eight ounces a day, and took twenty-four ounces of water. And from the thirty-sixth to the fortieth, and last day of the fast, he took eighteen ounces of water daily, and lost eight ounces a day.

438. One of the lessons taught by this long fast of Dr. Tanner's is that life may be sustained for a long period by water; and this lesson, if rightly considered, will help to

What is said of Tanner's fast? (436). What of water? (437-438).

correct some of the mischievous and erroneous notions that have clustered around medical theory and medical practice. Water, in a certain sense, is a food, and will maintain the integrity of the tissues, as they are more than three-fourths water. The solid foods (so-called) are composed largely of water. Even milk, the first food of the infant, upon which it lives and grows, contains only about twelve parts in one hundred of solid substance, the remainder being simple water. Milk is not only able to support the infant, but to sustain the life of older persons in sickness and in health. Prout ranked water as a dietetic with the non-nitrogenized substances—sugar, starch, etc., and it is well known that water contributes largely to all the transformations that takes place in the living organism. What must we drink? We must have something to drink, or cease to live, and all we drink is chiefly composed of water. Some persons seem to dread water, yet those that drink alcoholic liquors, drink generally more water than total abstainers, as all intoxicating drinks contain more than one-half water. The only question is in what form shall the water be taken? Shall we drink it pure or mixed? Shall it be hot or cold? If we desire only to dissolve the solid food, a pint of pure water will be better than a pint of beer or ale, as the alcohol it contains will prevent the solution of the albuminous portions of the food. All animals, by natural instinct, love water; and children, before their taste have been perverted, love it better than any other liquid except milk, which is nearly all water. It is sometimes given as a reason for drinking alcoholic drinks that the water is so impure; they seem not to reflect that the water in their favorite liquor is the same impure liquid, with the addition of alcohol, which, as already seen, is a product of decomposition and corruption, and that alcohol can only be drank by being diluted with water, which they say is too impure to drink alone—which only makes the impure more pure. Tea, taken hot, is more rapidly stimulating than alcoholic drinks; but it must not be taken hotter than one hundred and twenty degrees, or it will impede digestion, and if taken ice-cold it will also be injurious, for the same reason, Tea, while it acts as a stimulant to the voluntary motions, will not produce the irresistible craving as do alcoholic beverages. Coffee acts

similar to tea, but is more stimulating, while cocoa, in addition to the properties of tea or coffee, contains a certain portion of oily matter, which may serve a beneficial purpose in the economy. These drinks are free from the objections to alcohol, and do not create a bondage of the appetite—a slavery the most of all to be dreaded.

The following address to water, by John B. Gough—or Paul Dent, a southwestern pioneer missionary—is unsurpassed for beauty and eloquence in the English language:

JOHN B. GOUGH, ON WATER.

"Not in the simmering still over smoky fires, choked with poisonous gases and surrounded with the stench of sickening odors and corruption, doth your Father in Heaven prepare the precious essence of life, pure, cold water; but in glade and glassy dell, where the red deer wanders and the child loves to play—there God brews it; and down, low down in the deepest valley, where the fountain murmurs and the rill sings; and high up in the mountain-tops where the naked granite glitters like gold in the sun, where the storm-clouds brood, and the thunder-clouds crash; and far out in the wide, wide sea, where the hurricane howls music, and the big waves roll the chorus, sweeping the march of God; there He brews it—beverage of life, health-giving water. And everywhere it is a thing of beauty, gleaming in the dew-drop, singing in the summer rain, shining in the ice-gem till they seem turned to living jewels, spreading a golden vein over the setting sun, or a white gauze around the midnight moon, sporting in the cataract, sleeping in the glacier, dancing in the hail-shower; folding its bright snow-curtain softly around the wintry world: and weaving the many-colored iris, that seraph's zone of the sky, whose warp is the raindrops of the earth, all checkered over with the celestial flowers by the mystic hand of refraction—that blessed life-water. No poison bubbles on its brink; its foam brings not madness and murder; no blood stains its liquid glass; pale widows and starving children weep not burning tears in its depths. Speak out my friends: would you exchange it for the demon's drink, alcohol? NO! NO! NO! I hear

you answer in tones like the roar and rumble of the cataract of Niagara." Let all thank God for bright, sparkling, life-giving water.

"Water is best for the rich and the mighty,
Water is best for the humblest that toil;
Children and fathers may drink from the fountain,
Flowing forever to gladden the soil.

"Emblem of purity, truth, and of friendship,
Still let me love thee, and still be thou mine:
Gliding in streamlet and rolling in ocean,
Telling of God, ever-glorious, divine."

LESSON TWENTY-FIFTH.

ALCOHOL: AS AN AID TO DIGESTION, ETC.

439. If alcohol is not food, nor a solvent of food, can it aid digestion? In this case, as in the others, it is a deceiver—a mocker. Alcohol, instead of aiding digestion, retards and prevents it, by destroying the *pepsine*, the organic principle of the *gastric juice*, which is coagulated and precipitated by it.

440. Drs. Todd and Bowman said: "The use of alcoholic stimulants retards digestion by coagulating the *pepsine*, * * and were it not that wine, spirits, etc., are rapidly absorbed, their introduction in any quantity would be a complete bar to the digestion of food, as the *pepsine* would be precipitated from the solution as quickly as it is formed."

441. Dr. Dundas Thompson says: "It is a remarkable fact, that when alcohol is added to the digestive fluid, it produces a white precipitate, so that the fluid is no longer capable of digesting animal or vegetable substances."

442. A series of experiments was made by Dr. Monroe

What effect has alcohol on pepsine, etc.? (439). What said Todd and Bowman? (440). What did Dundas Thompson say? (441). Give Dr. Monroe's experiments? (442-443-444).

to establish the above, if true, and refute it if false. He had bottles containing finely minced meat with the gastric juice from the stomach of a calf.

443. In one bottle gastric juice was mixed with water, another with alcohol, and another with pale ale. The temperature was kept at 100°, and the contents were churned, to imitate the movements of the stomach during the process of digestion.

444. The following were the results:

Finely Minced Beef.	*1st bottle. Gastric Juice and Water.*	*2d bottle. Gastric Juice and Alcohol.*	*3d bottle. Gastric Juice and Pale Ale.*
2d hour.	The beef became opaque.	No alteration perceptible.	No change.
4th hour.	Digested and separating.	Slightly opaque, but beef unchng'd	Cloudy, with fur on beef.
6th hour.	Beef much lessened.	Slight coating on the beef.	Beef partly loosened.
8th hour.	Broken up into shreds.	No visible change.	No further change.
10th hour.	Dissolved like soap.	Beef, solid, on cooling. Pepsine precipitated.	Not digested. Pepsine precipitated.

445. By these experiments, it is clearly proven that alcohol destroys the solvent power of the gastric juice and prevents digestion; for even *pale ale*, with its five or six per cent. of alcohol, retarded digestion, and it is very certain that the stronger alcoholics will interfere still more with the solution of the food elements.

446. If alcohol destroys the organic principle on which

What do the experiments prove? (445). What is the effect of alcohol on digestion, etc.? (446-447-448-450).

digestion depends, it is evidently a very great mistake to take it either as food, or to aid the digestion of food.

447. Then again, alcohol coagulates albuminoid or colloid matter; and, as the gastric juice dissolves albuminous substances, it must interfere with the nutrition of the body.

448. The gastric juice, not interfered with, seizes at once upon the albuminous aliments and dissolves them, when they are changed into albuminose and absorbed into the circulation.

449. Alcohol in the stomach is a kind of a dog in the manger, for not only is it incapable of building up the tissues itself, but it prevents the solution of the substances which are the true builders and the nourishers of the tissues.

450. Alcoholic beverages do not and cannot aid digestion, but retard and prevent the solution of alimentary substances.

DOES ALCOHOL PRODUCE FORCE?

451. Some of the advocates and defenders of alcohol assert, that by its use, force is generated more abundantly.

452. This it cannot do, if it does not furnish anything to feed the blood, or store up nourishment to replenish the expenditure.

453. By their own theory, the increase of action must cause an increase of wear and tear, and this, instead of sustaining life or vitality, must result in a direct waste of vital force.

454. Dr. Parkes says: That "the use of alcohol in health, is not only unnecessary, but absolutely injurious."

455. If such are the effects of alcohol, how can it sustain vitality, be a supporter of health, or aid to perform either physical or mental work?

456. When disease becomes a supporter of health, then, and not till then, can we rationally conceive that it is possible for alcohol to sustain vitality.

What do some of the defenders of alcohol suppose? (451). Why cannot alcohol produce force? (452). What results by their theory? (453). What said Dr. Parkes of the effects of alcohol?

457. Dr. Smith says: "There is no evidence that it (alcohol) increases nervous influences, but that it lessens nervous power." There is no lack of proof that muscular power is weakened by even small doses of alcohl.

458. Dr. William Brunton says: "A moderate dose of beer or wine would, in most cases, at once diminish the maximum weight which a healthy person could lift. Mental acuteness, accuracy of perception, and delicacy of senses, are all so far opposed by alcohol, as that the maximum efforts of each are incompatible with the ingestion of any moderate quantity of fermented liquors."

459. And even Liebig said: "Wine is quite superfluous to man. * * It is constantly followed by expenditure of power." Thus, alcohol is an article foreign to all the normal wants of the human body. It can never give power like food, nor purify the blood like pure air, nor produce heat like the elements in bread, beef and potatoes, nor aid like water the circulation, the secretions and excretions of the body; but is an agent that deranges the functions of the organism, and disturbs their normal actions.

460. The perpetual and inevitable effects of all alcoholic drinks are to arrest the development of the blood globules, to irritate the mucous and other tissues, to impede digestion, deaden the nerve forces, produce unnatural excitement of the heart, quicken its motion, and expend the powers of the whole system. It is, therefore, physically impossible that alcohol, in any of its forms, can aid to sustain life.

461. Liebig said: "Spirits, by their action on the nervous system, enables him (the poor laborer) to make up deficient power at the expense of his body; to consume to-day that quantity which ought naturally to have been employed a day later. He draws, so to speak, a bill on his health-bank, which must be always renewed, because, for want of means, he cannot take it up. He consumes his capital instead of his interest, and the result is, the inevitable bankruptcy of body."

462. Alcohol surely cannot give force, if it consumes to-day what ought to be consumed to-morrow. The truth

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What said Dr. Smith? (457). What did Dr. Brunton say? (458). What did Liebig say? (459, 461). What are the effects of alcohol? (460). Can alcohol give force? (462-463).

of the matter is, that alcohol, in all its forms, blunts the *nerve forces* designed for the perfection of life—the maintenance and regulation of the vital functions.

463. To take a practical common sense view of the subject, what would we think of a merchant, who would draw a note out of bank, and pay a high rate of interest, when he could not invest the money in a profitable venture, or make any good use of it, but expend it in fast horses? Would it not be doing him justice to say he was either a fool or a rogue? Then how foolish is that man who, by the use of alcohol expends his vital capital, or life-forces, instead of the interest to be derived, day by day, from nutritious food.

464. While Tom Sayers, the English pugilist, was under training, a gentleman once said to him, "Well, Tom, of course, in training, you must take a deal of nourishment, such as beefsteaks, Barclay's stout, or pale ale?" "I'll tell you what it is sir," said Tom, "I am no tectotaler, and in my time have drunk a good deal—more than was good for me—but when I've any business to do there's nothing like water and the dumb-bells." This single sentence is worth more as an answer to the assertions of the advocates that alcoholics are wholesome nutriments, tonics, etc., than volumes of theory. Cold water made Sayers a Sampson, but when he retired from the prize-ring, and took to drink, it soon laid him in the grave. Weston, the pedestrian, who has walked over five hundred miles in six days, when asked if he did not drink some alcoholics, said if he had taken any intoxicating drink, he would have lost his wager. The only use he made of alcohol was to rub his feet with it, when they became tender. So much for the force generative power of alcohol.

ALCOHOL: AS A STIMULANT.

465. Among the reasons advanced for the use of alcohol is, that "it is a stimulant." It is said by persons within the medical profession, and others, that when a person is exhausted by over-work, a stimulant is needed, and that the term stimulant means some one of the alcoholic beverages.

466. What is a stimulant? It is something that spurs

What is said of Tom Sayers and Weston? (464). What is a stimulant? and how does it act? (466).

on to the more vigorous performance of the functions or duties; in other words, it is something that takes out of an animal body what is in it, similar to the application of the whip or spur to the worn-out horse, in place of hay, corn, and water. Food gives strength, while stimulants take it out, or extract from the animal some of its remaining strength.

467. To attempt to work on alcohol, or on stimulants, is to wear out ourselves, and ultimately to be losers by the speculation. As Dr. Mandsley says: "Like the pawnbroker or the usurer, alcohol is a present help at the cost of a frightful interest, and if the habit of recurring to it be formed the end must be a bankruptcy of health." A true stimulant, while acting in harmony with the powers of the system to resist the action of external forces, will also increase the activity of the functions and aid in the development and the proper distribution of the vital forces. The best stimulant is nutritious food. Nature never intended that we should live on any other stimulant; the others are only needed when we have violated hygienic laws, and their use should be reserved for a time of actual need, as their too frequent use will impair sensibility, and produce mental and physical debility.

468. Sir Benjamin Brodie says: "Alcohol removes the uneasy feeling and inability of exertion, which want of sleep occasions. But relief is only temporary." Stimulants do not create nerve force, they merely enable you, as it were, *to use up* that which is left, and then they leave you more in need of rest than before."

469. Dr. Benjamin says, in his Psychological Inquiries, (p. 143): "Stimulants do not create nerve-power; they merely enable you, as it were, to use up that which is left." If alcohol is a stimulant, and stimulants use up the nerve forces, how can it sustain them?

470. "A gentleman traveling in Ireland was astonished to find that in his bill of daily expenses there was one frequently recurring item, "refreshment for horse, two pence." What is the meaning of this?" he inquired. "O sir," was the reply, "*that is for whipcord!*" If that is what

What says Dr. Mandsley of alcohol? (467). What said Sir Benjamin Brodie? (468). What said Dr. Benjamin? (469). What is said of the traveler in Ireland, etc.?

you mean by stimulation, I am prepared to admit that alcohol is a stimulant. If refreshment, or stimulation, is whipcord, something to excite the force into action that is in the human body, I will admit the analogy, only, however, with a certain qualification. When you have the horse in hand, and between the shafts, and on applying the whip, you can make him go in any direction you wish. But in the human system, can you tell what direction the action of alcohol will take? The doctor may thereby liberate the force, but can he direct it, when he has done so?"*

471. Alcohol, to be a true stimulant, must increase the activity of the functions. Does it do this? In large doses it certainly acts as a narcotic—a paralyzer. Alcohol, we believe to be an anæsthetic and narcotic, and not a stimulant, and owes all its medical virtues to its narcotic effects.

472. A narcotic is a substance which being absorbed into the blood partially, or entirely paralyzes the nerve forces; in other words, partially or entirely destroys life. Alcohol is an acrid-narcotic poison. A man, after drinking a pint of whisky or brandy becomes helpless and senseless. What shall we call his condition? Are his powers stimulated or spurred on to a more vigorous performance of their duties? No! He is paralyzed, body and mind. He is narcotized, not stimulated. We must, therefore, conclude that the agent producing these effects is a paralyzer, a narcotic, and not a stimulant

473. Alcohol is, therefore, an agent, which, in large doses, paralyzes the nervous system, and must be a narcotic, or anæsthetic, like opium, chloroform, æther, etc. Dr. Anstie, it may be said, classed alcohol as a stimulant in small doses and in large ones a narcotic. The fact is simply this: that what he conceived to be stimulation, was a lesser degree of narcotization, modified by the efforts of the system to expel an intruder. If a pint of whisky or brandy will kill a man by entirely paralyzing the nerve

Is alcohol a stimulant? and why not? (471). What is a narcotic, etc.? (472). What are the actions of large doses of alcohol? (472). Does alcohol act as a stimulant or a narcotic? (473). What said Prof. Muller and Dr. Edwards? (473).

*Rev. Dr. Hugh Sinclair Paterson's Lecture: "Stimulants and Strength."

centres, a half-pint will half paralyze him, and in proportion as we reduce the quantity the effects will be lessened. Alcohol, like other narcotics, if frequently used, demands an increase of the dose to produce their effects, as they blunt or narcotize the nervous sensibilities. But, if even alcohol be a stimulant, what good can we expect from its use? "A stimulant," says Prof. Muller, "too often repeated, deadens the excitability of the organs and renders them insensible to the same stimulous for a long time." Dr. Edward says: "The action of alcohol in the human body in every case, and at every time, is that of a paralyzer." We may, therefore, safely affirm, that alcohol never sustains the forces of the body as food, never acts as a good, that it always acts as a narcotic, and is always a paralyzer of sensation and a destroyer of force.

474. Dr. Richardson says: "The temporary excitement it (alcohol) produces, is at the expense of the animal force; and that the ideas of its being necessary to resort to it, that it may lift the forces of the animal body into true, and firm, and even activity, or that it may add something useful to the living tissues are errors as solemn as they are widely disseminated. * * Excitement is wasted force, the running down of animal mechanism, before it has served out its time of motion. * * * When persons say they are being kept up by stimulants, they mean actually that they are being kept down."

What said Dr. Richardson? (474).

CHAPTER VIII.

ALCOHOL: AS A SUSTAINER OF VITALITY.

LESSON TWENTY-SIXTH.

DOES ALCOHOL SUSTAIN VITALITY?

475. The human system, the moment it begins to live, begins to die, or to be worn out in a certain degree, by functional activity; yet the organism has the power within itself to repair the wear and tear, if the elements suitable to build up the body, or to replace the worn out tissues, are supplied.

476. Whatever interferes with the proper nutrition will proportionally impair the vital forces. Whatever is taken into the human system will either benefit or injure it. It is a mischievous fallacy to suppose that anything can be taken into the body, that if it does no good it will do no harm. What is not, in relation to the human body, a food, in a state of health is a poison.

477. There is in the animal body a concentration of forces, or power to resist disease. When nutrition is impaired by bad living or other causes, these vital forces are enfeebled, and the power to resist disease is lessened.

478. The organism has not the power to generate force independent of what it derives from without; for its powers—mechanical, chemical and intellectual—depend upon the nutrition of the organs, which will fail in their power to perform their several functions if not properly nourished.

479. As alcohol cannot be assimilated or become a part of the tissues, it cannot nourish or strengthen the organism, or sustain its powers.

What takes place in the animal body? (475). What are the effects of impaired nutrition, etc.? (476). Why cannot alcohol generate force? (477-478-479-480).

480. According to MM. Lallemand, Perrin, and Duroy, alcohol passes out of the body the identical compound it was when it entered. Hence, alcohol not being decomposed or oxydized in the system, can neither become a part of the tissues, nor generate heat, and, therefore, can no more sustain vitality or produce force than the whip or spur can sustain the vitality, the strength, or the force of the jaded nag, or supply the place of corn, hay or oats. Thousands of men, in all the walks of life, in every condition and clime, have experienced that all kinds of alcoholic drinks are useless as supporters of vitality, or generators of force.

481. The nutrition of the tissues and organs depends upon the integrity of the blood corpuscles—derived from food. Hence, the quantity and quality of the blood will depend upon what we eat and drink.

482. In 1,000 parts of blood, in health, there are about 782 parts of water, 127 globules, and three of fibrine; solid matter of serum, including albumen, fat, etc., eighty parts; inorganic matter of serum, including salt, potash, etc., eight parts. The blood also holds in solution the products of disintegration on their way to be expelled from the body by the different excretory organs.

483. The blood corpuscles are of three kinds: 1st, A few molecules, which are composed of chyle, and are generally increased in number during active digestion. 2d, Colorless cells, which are identical with those of lymph. 3d, Colored corpuscles—the essential elements of the blood, which appear under the microscope of a straw-color, but when aggregated together in a mass, the color is red. These corpuscles are about 1-3200 of an inch in breadth, and 1-12,400 of an inch in thickness. (See plate of the Blood Corpuscles.)

484. Alcohol acts perniciously upon the red corpuscles by devitalizing them. Drs. Bocker and Virchow agree that alcohol poisons the blood, arrests development, and hastens decay of the red corpuscles. There is a loss of power in these corpuscles to absorb oxygen from the air, which also undergo a process of shrinking, by extracting the water from them; hence, less of the vitalizing oxygen

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Describe blood corpuscles? (481-482-483). How does alcohol affect the corpuscles? (484)

PLATE I.

ILLUSTRATIONS OF BLOOD CORPUSCLES.

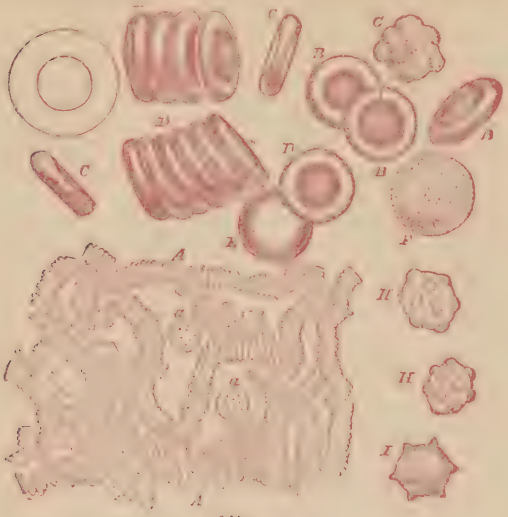

Fig. 1.

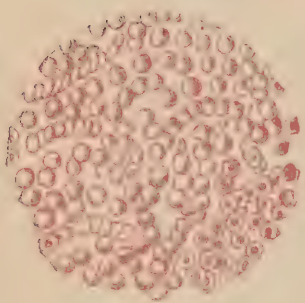

Fig. 2.

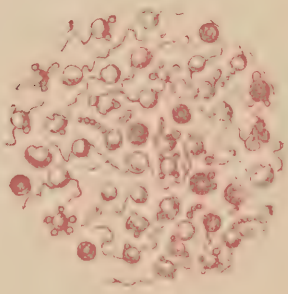

Fig. 3.

2 The blood corpuscles have darkened centres from the focal point at which they are seen. Others are in rolls, indicating slight inflammation.

3 Blood corpuscles altered by the action of diluted alcohol, or cherry wine.

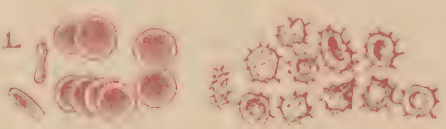

Fig. 4.

1 Appearance of the corpuscles of normal blood.

2 Appearance of the corpuscles of Dr. Tanner's blood after forty days of fasting from food.

is absorbed, and less carbon exhaled. It also diminishes the fibrine in the blood, thus preventing its coagulation, as well as the building up of fibrous tissues of the body. The blood, when in a healthy state, does not leave the vessels, but when deficient in fibrine, or the fibrine is held in too fluid a condition, the blood easily passes through the vessels, causing blotches on the skin and other membranous parts. It sometimes causes the blood to flow from the small vessels as from the gums, as in scurvy, etc. By examining the globules of Tanner's blood, at the close of his long fast, it will be seen that they appear very much like those acted upon by alcohol, having ragged edges and a shrunken appearance, instead of being smooth and round as when normal.

485. Prof. Schultz says, "alcohol stimulates the blood-discs to an increased and unnatural contraction, which hurries them to premature decay and death. The coloring matter is dissolved out of them, and the pale discs lose their vitality." (See plate I, figs. 2–3.)

Plate 1, fig. 1.—A, moderately magnified red corpuscles are seen lying in the rouleaux. At *a a* are seen two white corpuscles. B, red corpuscles much more magnified, seen in face. C, ditto, in profile. D, ditto, in rouleaux, rather more highly magnified. E, a red corpuscle swollen into a sphere by the imbibition of water. F, a white corpuscle magnified same as B. G, ditto, throwing out some blunt processes. K, ditto, treated with acetic acid and showing nucleus magnified same as D. H, red corpuscles or cernate all over. I, ditto, at edge.

486. Dr. Beale says, "it cuts short the life of rapidly growing cells or causes them to live more slowly." Nor does the injury rest here, for, as already seen, alcohol coagulates the albumen in the stomach, and acts perniciously upon the albumen in the blood, thus it seriously impedes and prevents the reparative processes.

487. Dr. Williams, after numerating some of the diseases caused by alcohol, says: "When taken only or chiefly with food, not as a substitute for it, but as constituents of general free living, fermented liquors contribute to the production of an abundant of ill-assimilated, over-heated blood, which either finds vent in eruptions of the surface, or in

What does Prof. Shultz and Dr. Beale say of alcohol? (485-486.) What said Dr. Williams? (487).

local hemorrhages, fluxes, or causes vertigo, stupor, billious attacks, dyspepsia, gout, or gravel." Hence, cannot sustain vitality.

LESSON TWENTY-SEVENTH.

ALCOHOL INJURES HEALTH AND DESTROYS LIFE.

488. "A food," besides containing the constituents of the tissues, must be innocent in relation to the tissues. Sufficient evidence has been presented to show that alcohol is not innocent, but its action is that of poison; and no physician will say it is not a disease-producer. As a disease-producer, it is unequalled by any other article used by civilized man, or even uncivilized.

489. It may, with equal truth, be fully demonstrated that the ratio of sickness and death, other things being equal, are in proportion to the use of, and to the facility for obtaining alcoholic beverages. It will be no exaggeration to say that nearly one-half, or at least one-third, of the present avoidable sickness and premature death, in most civilized countries, are directly, or at least indirectly, produced by the use of alcoholic drinks.

490. Neison's statistics show that the mortality of the intemperate from twenty-one to thirty years is five times that of the temperate, and from thirty to forty four times. The duration of life after the commencement of intemperate habits, among the drinkers of beer is 21.7 years; among spirit drinkers 16.7 years; and among the drinkers of both spirits and beer is 16.1 years. Thus we find that the number of deaths of drinkers, as a rule is in proportion to the alcoholic percentage of their favorite beverage. The spirit drinkers do not live as long by five years as beer drinkers, and the drinkers of both spirits and beer live six-tenths of a year less than the drinkers of spirits only. This is undoubtedly due to the excess of alcohol imbibed by them. For the spirit and beer drinkers are ready at all times, for all kinds, and never say "No!"

What is the relation of alcohol to disease, etc.? (489). Give Neison's statistics of mortality and their indications? (490).

491. That intoxicating drinks shorten life is well understood by Life Insurance Companies, for none, who have honest and intelligent officers and agents, will insure the life of an intemperate person; and in most companies, if not in all, the policy is forfeited if the death is found to be caused by intemperance. Dr. Carpenter said, "that at the age of forty, the annual rate of mortality for the whole population of England is about thirteen per thousand, while among the lives insured among Life Insurance Offices the deaths are about eleven per thousand. Between the ages of fifteen and seventy the average number of deaths is about twenty per thousand."

492. By a comparison between four general Life Insurance Companies, that insure the lives of moderate drinkers, and the Total Abstinence Section of the Temperance Provident Institution, it was found that the aggregate average mortality of the four general Life Offices was sixteen per thousand, and the Temperance Provident Institution was seven and a half per thousand, which show that total abstinence from alcohol reduces death at least one-half. It must be remembered that this is not the difference between the rate of mortality of total abstainers and the intemperate, but between moderate drinkers and teetotallers; for Life Insurance Companies do not insure the lives of intemperate persons. Then again: while the average duration of life of all ages in England is about forty-two years, among the Society of Friends is fifty-five years, due, no doubt, to the fact that many are total abstainers, and the remainder generally regular and temperate in their habits.

493. Dr. Cheyne estimates that if ten young men, on their twenty-first birth-day, were to begin to drink ardent spirits, or a pint of sherry, and to continue this daily, eight out of the ten would shorten their lives ten or fifteen years.

494. You may say that there are men and women who use moderately some kind of intoxicating drinks regularly all their lives and live to a good old age. This may be all

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What do life insurance statistics show? (491). What is the mortality of all ages in England, and among the Society of Friends, etc.? (492). What did Dr. Cheyne estimate? (493). What is said of the wine drinkers? (494).

very true; but the number who have been carried early to their graves by their drinking is not known. There is not the least doubt but that the advanced ages of moderate drinkers are due to the original strength of their constitutions, which enable them to resist the poisonous effects of the drink. A gentleman well advanced in years, a moderate drinker, one of Bishop Berkley's "devil decoy ducks;" on one occasion boasted that he had drank two or three bottles of wine every day for fifty years, and he was hale and hearty as ever. "Pray," remarked a by-stander, "where are your boon companions?" "Ah!" he quickly said, "that's another affair; if the truth must be told, I have buried three generations of them."

495. There are many diseases caused by alcohol that the masses of the people know not of. Among the diseases caused by alcohol are diseases of the BRAIN and NERVOUS system, as *apoplexy*, *epilepsy*, *paralysis*, vertigo, softening of the brain, delirium tremens, dipsomania—an inordinate desire or craving for strong drink—loss of memory, and the general failure of the mental powers, called dementia.

496. Diseases of the lungs: one of the forms of consumption, congestion, and subsequent bronchitis, disease of the heart, irregular beat, feebleness of the muscular walls, dilation, disease of the valves.

497. Disease of the blood: scurvy, excess of water or dropsy, separation of fibrine.

498 Diseases of the stomach: feebleness of the stomach and indigestion, flatulency, irritation, and sometimes inflammation. Diseases of the bowels: relaxation or purging, irritation.

499. Diseases of the liver: congestion, hardening and shrinking, cirrhosis.

500. Diseases of the kidneys: the change of structure into a fatty or wax-like condition, and other changes leading to dropsy, or, sometimes, fatal sleep.

501. Diseases of the muscles: fatty changes in the muscles, by which they lose their power for proper active contraction.

502. Disease of the membranes of the body: thicken-

What diseases are caused by alcohol? (495-496-497-498-499-500-501-502).

ing and loss of elasticity, by which the parts wrapped up in membrane are impaired for use, and premature decay is induced.

503. When deaths from these diseases are recorded, though alcohol is the primary cause, they are generally set down to some other, while the true cause that produced the death is covered up by some disease which could not have had an existence but for alcohol.

504 The effects of alcoholic liquors are more clearly seen by comparing the mortality of persons engaged in the liquor trades with those in other occupations.

505. By the Report of the Register General of England, the mortality of persons engaged in the liquor business, from twenty-five to forty-five years of age, is twice as great as that of farmers and graziers.

506. People in the liquor business are, as a class, very comfortably situated. They live in warm, comfortable houses; have plenty of food, and are not compelled to be out, exposed to all kinds of weather, at all times of the day and night, as policemen and railway men, and men of other trades.

507. Yet, notwithstanding these advantages, by the English records, one hundred and thirty-eight persons in the liquor trade die in proportion to one hundred of the whole of the community engaged in seventy of the leading occupations. Even the persons working on railways, and exposed to many dangers, only one hundred and twenty-one die to one hundred and thirty-eight liquor dealers. Dr. Monroe, of England, comparing the sickness and death of two large societies under his charge, one total abstainers, and the other non-abstainers, says: "The total abstainers have much better health and fewer deaths than the moderate drinkers. In the non-abstaining society the average amount of sickness the last year was eleven days and twenty-one hours per member, and deaths about one and a half per cent. In the total abstinent society the sickness did not average more than one and three-fourth days per member, and the number of deaths was only two in five years, or less than one-fourth of one per cent. per annum.

What is the mortality of liquor dealers, etc.? (504-505-506-507). What does Dr. Monroe say? (507).

The various diseases in both societies were treated by Dr. Monroe without alcoholic liquors in any form.

508. By a paper read at the celebration of the Temperance Jubilee, at Bradford, England, June, 1880, prepared by Dr. F. R. Lees, comparing the mortality of the Rechabites of Colne Tent, with the Colne Wesleyan Friendly Society, England, and the Bradford District of Odd Fellows with the Bradford District of Rechabites—the average sickness of the Rechabites for ten years is five days and eighteen hours, and the average death rate 9.9 per 1000. The average rate of sickness for the Wesleyan Friendly Society is ten days and nineteen hours, and the average death rate is 13.9 per 1000, or a gain in favor of the Rechabites of five days and one hour sickness, and a less death rate of 4 per 1000. In the Bradford district, the Rechabites average sickness for eight years was four days and two hours; death rate 1 in 141, and payments averaged 5s. 9½d. The Odd Fellows average sickness for eight years, thirteen days and ten hours; death rate 1 in 44, and payments an average of 13s. 1d. The figures speak for themselves.

509. The United Kingdom Temperance and General Provident Institution, a life insurance company, which insures members in two sections, one, in which all the members are total abstainers; in the other, moderate drinkers, as all intemperate persons are excluded. The two sections are alike in every other respect. About twenty thousand lives are insured in the general section, and ten thousand in the temperance section. During the years 1866 to 1879 inclusive, in the general section, 3,450 claims, or deaths, were expected, and 3,444 were actually made. In the temperance section 2,002 deaths were expected, but only 1,433 occurred. The deaths among the abstainers were twenty-nine per cent. less than among the moderate drinkers.

The Harveian Medical Society of London, published the following returns, collected from several members of the society practising chiefly among the middle classes in London, of the extent of which alcohol acted as a cause of death in cases whose death certificates they had filled

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What is said of Rechabites, etc.? (508). What is shown by life insurance statistics? (509).

up. "Out of 1,615 deaths of adults, 188 (11.64 per cent.) were partially, and 74 (4.58 per cent.) were wholly due to alcohol, making altogether 16.22 per cent." The foregoing facts indicate to some extent the sickness and death by alcohol. In this relation, as in all others connected with the evils resulting from alcohol, these facts are only the most obvious, the great majority are too deeply hidden in domestic privacy to be seen.

LESSON TWENTY-EIGHTH.

ALCOHOL: ITS USE IN HOT CLIMATES, ETC.

510. Total abstinence is as beneficial in hot climates as in cold. Bruce, who explored Abyssinia more than a hundred years ago, said: "I laid down then as a positive rule of health, that spirits and all fermented liquors should be regarded as poisons, and for fear of temptation not to carry them along with you, unless as a menstrum for outward application. Spring, or running water, if you can find it, is to be your only drink."

511. Waterton, the naturalist, who traversed the mountains and plains of South America, said: "I eat moderately, and never drink wine, spirits, or any fermented liquors in any climate. This abstemiousness has ever proved a faithful friend." He died by an accident at the age of eighty-five years.

512. Livingstone, in 1862, wrote: "I lived on the principle of total abstinence from all alcoholic liquors during more than twenty years. * * * the most severe labors or privations may be undergone without alcoholic stimulus; because those of us, who have endured the most, had nothing else than water, and not always enough of that." After his discovery by Stanley, he wrote that "he had known drink, and the vices it engendered, kill off many European adventurers in Africa."

What was said by Bruce of the use of alcohol, etc.? (510). What said Waterton? (511). What was said by Livingstone? (512(.

513. Backhouse, who in nineteen months traveled six thousand miles in the interior of Africa, said: "I have traveled over hot sands, so that the very dogs howled with pain while treading on them, and the water was so bad we had to conceal the taste with coffee. There is no single act of my life to which I look back with greater satisfaction than to the adoption of total abstinence." Dr. Mosely says ("Tropical Diseases"): "I aver, from my own knowledge, as well as the observation of other people, that those who drink nothing but water, or make it their principal drink, are but little affected by the climate, and can undergo the greatest fatigue without inconvenience, and are not subject to troublesome or dangerous diseases."

514. Sir Charles Napier, when reviewing his soldiers at Calcutta (1849) said to them: "Let me give you a bit of advice—that is, don't drink. I know that young men don't think much about advice from old men. They put their tongue in their cheek and think they know a good deal better than the old cove who is giving them advice; but if you drink, you are done for. You will either be invalided or die."

515. Dr. Jackson, an eminent surgeon in the British army said: "I have wandered a good deal about all parts of the world; my health has been tried in all ways, and by the aid of temperance and hard work I have worn out two armies in two wars, and probably could wear out another before my period of old age arrives. I eat no animal food, drink no wine or malt liquor, or spirits of any kind."

516. H. Marshall, Esq., Deputy-Inspector-General of Army Hospitals, said before the Parliamentary Committee: "In all climates the temperate livers are the fittest to endure fatigue. Dr. Jackson traveled one hundred and eighteen miles in Jamaica in four days, and carried baggage equal in weight to the common knapsack of a soldier. * * * Personal experience has taught me that the use of ardent spirits is not necessary to enable a European to undergo the fatigue of marching in a climate whose mean temperature is 73° and 80°. * * * So far from being calculated to assist the human body in enduring fatigue, I

What was said by Backhouse and Dr. Mosely? (513). What said Sir Charles Napier? (514). What is the testimony of Dr. Jackson? (515). What said Inspector-General Marshall? (516).

have always found that the strongest liquors were the most enervating; and this is in whatever quantity they were consumed.

517. Dr. Gardner said: "Whoever drinks stimulating liquor, and travels day after day in the sun, will certainly suffer from headache; and in countries where *miasmata* prevails, he will be far more likely to be attacked by the diseases, which are there endemic." Dr. James Johnson, after twenty years' experience in the tropics, said: "Common sense alone would point out the propriety of avoiding heating and stimulating drinks." And Dr. Ward, of Sumatra, said: "I have had the opportunity of observing for twenty years the comparative use of the coffee leaf in one class of natives, and of spirituous liquors in another—the native Sumatrans using the former, and the natives of British India, settled here, the latter, and I find that while the former expose themselves with impunity to every degree of heat, cold and wet, the latter can endure neither wet nor cold for even a short period without danger to their health."

518. Sir W. F. Williams, the defender of Kars, said: "I am indebted to a gracious Providence for preservation in every unhealthy climate; but I am satisfied that a resolution early formed and steadily persevered in, never to take spirituous liquors, has been the means of my escaping diseases by which multitudes have fallen around me. Had not the Turkish army of Kars been literally a "cold water army," I am persuaded they would never have performed the achievements which crowned them with glory."

519. Not only can the heat of the tropics and other regions be withstood better without alcoholic drinks than with them, but those who are employed at hot and laborious work can perform their tasks better without them." Numerous testimonies of anchor-smiths, glass-blowers, chain-makers, puddlers, etc., have been given in this country and England, one and all agree that they can do their work with much greater ease, and for longer hours, since they practiced the principles of total abstinence, than when they used alcoholic drinks. To illus-

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What said Dr. Gardner and Dr. Johnson? (517). What did Dr. Ward say? (517). What was said by the defender of Kars? (518). What is said of persons employed at hot work? (519).

trate this point, we will give one instance of the many that might be presented.

520. Before total abstinence had been tried to any very great extent in England, Dr. Beddoes ascertained that the hardest working men were those who forged ship anchors, who were also exposed to great extremes of heat and cold. They were allowed by their employers an unlimited amount of strong beer. Dr. Beddoes proposed to the men that six of them should drink only water for one week, while six others should continue their usual allowance of beer. The men astonished at such a proposition exclaimed: "Why, you want to kill us! Do you for a moment suppose it possible that we can endure such fatigue—that we can weld a ship's anchor and only drink water? You must surely intend to kill us." "No," said the doctor, "I have no such wish or intention. I am a physician, and shall carefully watch the progress, so that no injury shall ensue to you. I will put down fifty pounds. Try water for one week; if you succeed the fifty pounds are yours; if not, I shall put them back into my pocket." They agreed to the proposition. The two sets of men were pretty much alike during the first day of the trial; the second day the water drinkers complained less of fatigue than the others; the third day the difference was more apparent, in favor of the water drinkers; the fourth and fifth days it became increasingly so; and on Saturday night the water drinkers declared that they never felt so fresh in all their lives as they had felt that particular week.

LESSON TWENTY-NINTH.

ALCOHOL DOES NOT PREVENT DISEASE—LAGER BEER WILL NOT PREVENT CHOLERA.

521. If alcohol has any prophylactic virtue, or power to prevent disease, we should expect it to prevent cholera, as the Brewers' Congress claimed for lager beer, in 1867.

What did Dr. Beddoes propose to the anchor-smiths? (520). What does the Brewers' Congress claim? (521).

522. Speaking of cholera, Dr. Jameson says: "Let us seek for his haunt, and we shall find, that although his chariots are aerial, and their course erratic, the poison of his nostrils is seen to come and go, and in his rambles he has preference for mud and mire, crowded houses and low places; his great love is for drunkards and the high fed; * * * he has his times to do and not to do; but when he holds his gala days, naught but a guarded moderation in all things, will turn aside his swift-flighted chariot of desolation and death. * * * He comes with the power of the vampire to suck out our blood, he exerts the art of the collier and fills your veins with charcoal; he shuts up the normal outlets, and make sluices of those that should be shut, * * * amid all the riot, amid all the conflicting abnormal strife, there comes the heavy, dreamy, the incubus of death, and stuffs your brain with unvitalized blood and sits sullen upon your powers of thought."

523. Alcohol, as seen, prevents the normal changes of the blood; that it plies like cholera, the art of the collier, by changing the arterial blood into venus, without the substance of the tissues having taken any share in the transformation. Hence, alcohol tends to produce a condition in the system resembling cholera.

524. The alcohol in lager beer is essentially the same as in whisky or brandy; besides this, there are many ingredients used in making malt liquors which add to the injurious effects of alcohol, making beer, ale and porter really more deleterious than distilled spirits. This has been proved by the effects of malt liquors on the draymen of London, and other copious beer drinkers.

525. "The cholera," said a Warsaw physician, "does not seize on his victim at hazard. This contagion, up to the present period, has respected all persons who lead regular lives, * * * has struck without pity every man worn out by excess and weakened by dissipation."

526. It has been proved as clear as statistics can prove anything, that ninety out of every hundred persons who die of cholera were in the habit of using alcoholic drinks.

What said Dr. Jameson of cholera? (522). How do the effects of alcohol correspond to those in cholera? (523). What are the ingredients of malt liquors? (524). Can they prevent cholera? (524). Who are the chief victims of cholera? (525–530).

As fewer women in the past were addicted to strong drink, so we find that fewer women are attacked with cholera. By Prof. Mackintosh, five-sixths of all who have fallen by cholera in England were persons of dissolute and intemperate habits.

527. Bronson, of Montreal, said: "The habitual use of ardent spirits in the smallest quantity, seldom fails to invite cholera and render it incurable."

528. The Morning Herald, (an English newspaper) said: "Intemperance is a qualification, which it (the cholera) never overlooks." It has often been known to pass harmless over a wide population of temperate country people, and pour down as an overflowing scourge upon the drunkards of some distant town.

529. During the cholera, in 1832, on the authority of a Montreal journal, not a drunkard had been attacked that recovered—almost all the victims were moderate drinkers. Dr. Rhineland, visiting Montreal in 1832, said: "The victims of the disease are the intemperate."

530. Dr. Sewell said: "Of two hundred and four cases of cholera, in Park Hospital, New York, only six recovered, and they were temperate persons." The facts were similar in other hospitals. Mr. Huber, who saw in one town in Russia two thousand one hundred and sixty persons perish in twenty days, said: "It is a most remarkable circumstance that persons given to drink have been swept away like flies. In Tiflis, with twenty thousand inhabitants, every drunkard has fallen—all are dead, not one remaining."

531. The moderate use of any kind of alcoholic drinks debilitates the stomach and the digestive organs, and hence, the users become the early victims of cholera and other epidemic diseases that may be prevalent. It is a physical impossibility for any person to use intoxicating drinks, daily, and not be injured by them. Low and intemperate habits are at any time strong inducements of disease; but far more so when an epidemic is prevalent. Nor is this the case of spirit drinkers alone, for the moderate use of malt liquors are proportionally as injurious. Malt liquor drinkers are prone to apoplexy and palsy. Dr. Mussey said: "If I must drink any quantity of alcohol

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What are the effects of the moderate use of malt liquors? (531). Is it safe to use them regularly? (531). Why? (531).

in a specified time, I should think best to take it in distilled liquors rather than in cider, wine or beer." A liquor dealer in Glasgow lamented that the cholera had cut off half his customers. Brandy once was claimed to be a preventative of cholera, but it has been clearly demonstrated that it is a conductor and promoter of that disease. It is a well established fact, that a single act of intemperance during the prevalence of cholera often produces a fatal attack.

532. After the jubilee of the English Reform Bill, September 25th, 1832, and again in Scotland, January 1st, 1849, there was a great increase in the number and severity of cholera cases in consequence of the drunkenness on those days.

533. By Prof. Adams, of cholera patients treated by him, 91 1-5 per cent. were intemperate, and 19 1-5 per cent. temperate. He says: "I have found the use of alcoholic drinks to be a great disposing cause of malignant cholera. So strong is my opinion on this point, that were I one of the authorities, and had the power, I would placard every spirit shop in town with these words, 'CHOLERA SOLD HERE.'"

534. In the cases of death by cholera the change that takes place in the blood is not dissimilar to that which Liebig says alcohol produces on the vital fluid and all the tissues of the body. It would, therefore, be absurd for persons to resort to alcohol, in any of its forms, as a preventive of cholera, or any other disease.

535. In New Castle, England, on Christmas day, 1848, in the lower part of the town, men and women were staggering in a state of intoxication, during that night and two days following, no less than ninety-eight were attacked by cholera; a very large proportion died in a few days. From December 25th to January 5th, there were three hundred and twenty-five cases and one hundred and two deaths. In one street, parallel with the river Tyne, it swept off almost every drunkard, from one end of the street to the other.

536. At first the nurses in the cholera hospital at Man-

What were the effects of drinking in England? (532). What did Professor Adams say? (533). What are the changes in the blood by cholera and alcohol? (534). What is said of cholera in New Castle, Eng.? (535). What of the nurses in Manchester hospital during cholera? (536). What said the Dean of Westminster, London? (536).

chester, England, were worked only six hours a day, and then allowed to go home, and the mortality was so great among them it was feared the supply of nurses would give out. It was discovered that the leisure hours of the nurses were spent in drinking. They were then confined to the hospital, when not another case occurred among them. The Dean of Westminster, London, said: "God works no miracle to save the uncleanly and intemperate. It was solemn mockery to pray to God to preserve us from disease if we took no pains of preservation after all our warnings."

537. Rev. Dr. Lee, of St. Luke's Church, Rochester, in a Thanksgiving sermon, speaking of five hundred persons swept away by cholera, said: "Most of the adults were victims of intemperance. * * * Never did I more heartily deprecate the vice of drunkenness than when, on some occasions, I was not only forced to think of the ghastly tenant of the coffin as having, as it were, reeled and staggered into eternity, but was also forced to see living drunkards my attendants at the place of burial, and so under the influence of intoxication, at the very grave, as to unfit them to render the needed aid to those who bury the dead. On one occasion I remonstrated with the only persons—four in number—who constituted the company at the grave, all of whom were partially intoxicated, and within three days they had all died of cholera and were in their graves near the spot where I had forewarned them."

538. The sense of warmth, or irritation, falsely called stimulation, produced by alcoholic liquors, led, no doubt, to the erroneous notion that they would prevent cholera; which notion is as false as it has proved fatal to thousands. The effects of all kinds of alcoholics are to reduce the temperature of the body; retain the waste matter; instead of stimulating they narcotize; reduce the life forces, and predispose the system to all kinds of disease.

What said Rev. Dr. Lee? (537). Give arguments against alcohol as a preventive of cholera? (538).

LESSON THIRTIETH.

TOTAL ABSTINENCE PREVENTS CHOLERA, ETC.

539. Having seen that intoxicating drinks are really cholera conductors, let us see the effects of abstinence from them. In Albany, in 1832, the cases of cholera, over sixteen years of age, were as follows: intemperate, one hundred and forty; free drinkers, fifty-five; moderate drinkers, thirty-one; strictly temperate, five; members of temperance societies, two; total, three hundred and thirty-three. Population, twenty-six thousand; members of temperance societies, five thousand. While only one out of every twenty-five hundred members of temperance societies died of cholera, one out of sixty of the whole population fell victims of this disease. Of the two temperance men, one was much distressed with fear, and often told his wife he would die of cholera, causing great mental depression, loss of appetite, and had a diarrhœa, which he neglected; the other was in ill-health for sometime before the attack, had labored hard and exerted himself after diarrhœa.

540. In New York city, of five thousand members of temperance societies two only died. Of the Hibernian Temperance Society, with one hundred and twenty-three members; and the African Temperance Society, of one hundred and ninety-three members, not one of either society died of cholera, showing that neither the laboring classes, nor the colored race, providing they do not invite the disease by using alcohol, are not more liable to cholera than any other class or race. Of those dying of cholera in New Orleans, three only were temperance men, out of a membership of twelve hundred and forty-three. Of these, one had been a member but a week, another less than a month; consequently, neither had entirely recovered from the injurious effects of the use of intoxicating drinks; and the third was a watchman, subject to great exposure.

541. The proportions of deaths from cholera in New

What proportion of total abstainers die of cholera? (539). What proportion in New York city? (540). In New Orleans? (541).

Orleans was fifteen per thousand; whilst of the Sons of Temperance, only one in four hundred.

542. When the cholera was in Edinburg, during the winter of 1848–9, not a teetotaller was attacked with it. There was in Paisley, Scotland, 60,963 inhabitants, with 337 cases of cholera, or one to every one hundred and eighty-one of the population; whilst among total abstainers only one died out of a membership of two thousand. The returns of mortality among European troops at Madras, for 1849, show that the ratio of deaths among the teetoltallers was a little more than eleven per thousand; whilst among the intemperate it was over forty-three per thousand. Thus four times more intemperate soldiers die than teetotallers.

543. In Newark, Ohio, in 1854, thirty or forty persons died of what was called cholera in about thirty-six hours. The physicians and people were completely horrified at this fearful mortality; but, after a little investigation, it was discovered to be caused by beer, and that all who had resorted to beer, to quench the thirst caused by the fever, died.

544. In the year 1847, the 84th regiment marched by wings from Madras to Secunderbad, nearly five hundred miles, or a march of forty-seven days through a country noted for the prevalence of cholera and dysentery, and was very much dreaded on account of the sickness and death usually occurring during and after the march.

545. The strict rule of total abstinence was adopted by nearly the whole of the regiment. They passed through several marshy districts, the men being often knee deep in water. During the whole march there was not a case of either cholera, fever or dysentery, except two cases of chronic dysentery, that were taken out of the hospital at Madras. On the other hand, the 63d regiment, passing through the same country at the same time, lost a large number of men, and had so many sick, that when the regiments met it was compelled to borrow the dhoolies (a sort of ambulance) of the 84th regiment.

What proportion in Edinburg, etc.? (542). What results can you show of total abstinence in India? (542). What is said of cholera in Newark, Ohio? (643) What were the effects of total abstinence in the 84th regiment in India? (544-545).

546. The nine months the 84th was at Secunderbad—the most unhealthy in the presidency—the mortality was thirty-four per thousand, less than half the number lost by the 63d regiment in the nine months preceding its removal.

547. By later accounts from India, there was admitted to the hospital one in every 9.8 intemperate, while of temperate soldiers was only one in 27.1. The deaths in 1865 were in the proportion of one to 16.4 temperate, and one to 7.2 intemperate.

548. In Bengal the sick rate (daily per cent.) was three for teetotallers, five for temperate, and eight intemperate. The mortality was one per cent. teetotallers, two the temperate, and four the intemperate.

549. After the terrible epidemic which afflicted Ireland in 1846–7, Father Matthew said: "The pestilence that has ravaged our country has passed lightly over the teetotallers; there has been but very few who did not recover from that fatal disease. Like the cholera, the intemperate were its victims." Here is the same old story of the effects of alcohol. Everywhere, in all climes, and under all circumstances, there is "DEATH IN THE CUP."

550. Rev. J. Gelson Gregson, missionary from India, in an address in London, January 4th, 1881, said: "Now, I can appeal to returns which have not been cooked by rabid teetotallers, but signed by medical officers, which tell you what I believe to be the honest truth, that India's bottle has buried more men in India than India's sun. The man who goes to India with the notion that he is not going to live in that country without liquor, won't live in that country with it. * * * Nearly all those cases of so-called *heat apoplexy* would be more properly called *bottle apoplexy*.

551. "We have these returns, they tell us distinctly we (teetotallers) have fewer men in hospitals than the drinkers, fewer men sent to the hills, and fewer men die. * * * With equal fairness we establish our case, * *

What the difference of mortality in the 63d and 84th regiments? (546-547). What is said of the sick rate in Bengal? (548). What did Father Matthew say? (549). What did Rev. J. Gregson say of apoplexy in India, etc.? (550). What of teetotallers, etc.? (551). What of Sir Robert Sale? (551)

that there is nothing in the work of total abstinence that will incapacitate a man for duty in the burning plains of India. Read up the case of Jellalabad. We have heard the name of Havelock mentioned. Sir Robert Sale has left it on record, that on the march soldiers never endured greater privations, and never discharged their duties with greater cheerfulness. There never was less sickness and crime in the regiment than there were at Jellalabad, and says Sir Robert Sale: 'I attribute this to the fact that we got no liquor.' If, then, you can in the one case go to the very fountain and very source of your crime, the absence of that gives to us almost perfect immunity from sickness and crime in the garrison.

552. "There are nine thousand abstainers in the Indian army, * * they can be turned out of regiment after regiment, if wanted. The returns show that we have reduced the consumption of rum in India up to the years 1879–80, 87,000 gallons less than in 1871–2, which is substantial evidence that there is a good deal of pledge keeping. * * Those three regiments at Sherpur, the 67th, the 72d, and 92d, were the strongest temperance regiments in India; hence, the result: of 5,000 defending the camp, surrounded by 60,000, and to stand, waiting to be relieved; * * the discipline that was maintained, and the determination which carried them through all difficulties, was due to the discipline. A great deal of the discipline is to be attributed to the fact that we have strong temperance organizations in these regiments."

553. The position of the advocates, that beer, brandy, or other intoxicating drinks will prevent cholera or other diseases, is like the old woman's, who met a physician in London and asked him which he liked best, gin, rum, or brandy? He replied "that he was not in the habit of taking either." "What, said she; "not drink gin? I like gin best of everything; for I have been in the hospital and know all about it. Gin only eats the skin of the liver, rum fills it up like a sponge, but brandy eats holes in it that I could put my finger in."

554. We conceive that there are many who have been in the hospital, and know all about it, who, like the old

What of the number of teetotallers and the reduction of the use of liquor, etc, ? (552). What was the old lady's testimony ? (553). What will total abstinence, etc., do ? (554).

lady, will drink because they like it, even if it does eat the skin of the liver. There is not, we believe, a disease known to the medical profession but what may, and very often is, aggravated by alcohol; and that total abstinence from intoxicating drinks, and temperance in the use of all good and useful things is the only true preventive of disease.

CHAPTER IX.

ALCOHOL: AS A DISEASE PRODUCER.

LESSON THIRTY-FIRST.

DISEASES OF THE STOMACH.

555. Alcohol, as already seen, is an acrid-narcotic poison, or a substance which produces irritation, while it blunts the feelings, destroys sensibility, and causes degeneration of the tissues. The first action of alcohol is irritation, which, if long continued, passes into inflammation, which is the very reverse of nutrition.

556. This is the work of alcohol in the stomach until it is absorbed into the blood and becomes diluted in its circulation through the various organs and tissues,

557. The process of digestion is stopped as long as any inflammation exists in the stomach, hence, whatever tends to inflame that organ impedes or destroys digestion, and will produce functional and organic disease of that important organ. Alcohol is also an astringent, so that when it is applied to animal tissues it makes them hard.

558. The irritating and narcotizing actions of alcohol are very injurious to any tissue, but especially so to a tender and vascular part like the mucous membrane of the stomach. Hence, dyspepsia and other diseases of the stomach are very frequently the result of its use.

559. Once, and only once, we believe in the history of man, has a human eye been able to look into a human stomach and watch the processes of digestion.

560. By a most remarkable, perhaps we may say providential coincidence, in 1833, the very year when, in Preston, England, the temperance reform was reconstructed on the

What does alcohol do? (555). What is its action on the stomach? (556). Give the history of Alexis St. Martin. (559-560.561).

rational and solid basis of total abstinence. "The Experiments and Observations on the Gastric Juice, and the Physiology of Digestion," by Dr. Beaumont, Surgeon in the United States army, were published at Plattsburg. From this work we learn, that in 1823, three years before the formation of the American Temperance Society, Alexis St. Martin, a young Canadian, received a gun-shot wound, which took away a portion of the left lung, and made an opening in the top of his stomach.

561. But wonderful to consider, the man, after two years, was restored to his accustomed health, but the opening never closed. Nature, in her endeavor to repair the injury, developed a valve, or a kind of door, which retained the food in the stomach when closed with a pad and bandage.

562. Dr. Beaumont, perceiving the value of this accident to science, took St. Martin into his employ as an officer's servant, and for several years experimented upon him, using the opening as a door by which he introduced various substances, and also as a window to look into his stomach and examine their effects; and, as already said, the observations were published in 1833.

563. By these experiments Dr. Beaumont ascertained the time required to digest the various articles of food, and he also noted the effects of the errors of eating and drinking. Did St. Martin's stomach ache, he looked in, and sought for the trouble, and placed into it the rectifying dose.

564. He saw that a glass of brandy caused the mucous coats of the stomach to become inflamed. (See Plate II, fig. 2). It made no difference whether St. Martin drank brandy, whisky, wine, cider, or beer, except as one was stronger than the other; the effects of all alcoholics were irritation and congestion of the coats of the stomach.

565. "Simple water," said Dr. Beaumont, "is perhaps the only fluid that is called for by the wants of the economy." "The whole class of alcoholic liquors," he says, "may be considered as *narcotics*, producing very little difference in their ultimate effects on the system."

Give the experiments on him by Dr. Beaumont. (562-563). What were the effects of brandy, etc.? (564). What is said of water? (565).

566. "July 28, 9 o'clock A. M. Stomach empty, not healthy. Some inflammation with ulcerous patches on the mucous surface." Why these ulcers, etc.? Dr. Beaumont said: "St. Martin has been drinking ardent spirits freely for eight or ten days, yet he complains of no pain, nor shows symptoms of any general indisposition; says he feels well and has a good appetite." (See Plate II, figs. 2 and 4).

567. He looks again into St. Martin's stomach and writes: "August 1, 8 o'clock A. M. Examined before eating anything; inner membrane of the stomach unusually morbid; inflammatory appearance more extensive and ulcerous spots more livid; from the surface of some are exuded small drops of grumous (thick, clotty,) blood. The ulcerous patches are larger and more numerous, the mucous covering thicker than common, and the gastric juice more vitiated. The gastric fluids extracted this morning were mixed with a large proportion of thick, ropy mucous, and considerable *muco-purulent* matter, slightly tinged with blood, and resembling the discharge from the bowels in some cases of chronic dysentary.

568. "Notwithstanding this diseased appearance of his stomach, St. Martin complains of no symptoms indicating any general derangement of the system except an uneasy sensation and tenderness at the pit of the stomach, some vertigo, with dimness of vision on stooping and rising again.

569. "These morbid changes are seldom indicated by ordinary symptoms, unless when in considerable excess. It is interesting to observe to what extent the stomach may become diseased without manifesting any external symptoms of such disease."

570. Again he says: "The free ordinary use of any intoxicating liquors, when continued for some days, invariably produced these morbid changes, viz: *inflammation*, *ulcerous patches*, *vitiated secretions*, and finally, *muco-purulent matter*, *tinged with blood.*"

571. We cannot place too high value upon these observations, as they are ocular demonstrations, actual views

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In what condition was St. Martin's stomach, and why? (566-567). Did he complain of pain? Why? 568-569). What does he say of the free use of alcoholics? (570), What value should we place on these observations? Why? (571-572).

of the stomach, from day to day, for a series of years, in disease and health. These changes are not produced by ardent spirits alone, but also by beer and wine.

572. These morbid changes could not have been anticipated by any external sign, their existence was only ascertained by ocular demonstration. How important it is that we should bear in mind that the stomach may be extensively diseased by alcohol and the drinker not be aware of it. It shows, also, how dangerous it would be to attempt to carry into practice the new philosophy, that a man must judge by his feelings when alcoholic drinks are injuring him.

573. There is not the least doubt but that the moderate and regular use of intoxicating drinks produce results upon the stomach similar to those produced on St. Martin, in a greater or less degree, according to the quantity, strength, and the frequency of taking the poison. And yet, by its narcotizing influence, the stomach will give no signal of distress for a long time.

574. This blunting effect of alcohol upon the nerves of the stomach, and indeed upon the whole nervous system, so conceals the true conditions, so hides the real state of affairs, that the drinker while sipping his brandy, wine and ale, may be unaware that fatal and extensive disease is already produced, and the foundation laid of disease and death.

575. When the stomach is healthy we feel no uneasiness. Indeed, we do not know anything of our stomachs from our feelings. But when a person who uses alcoholic drinks feels pain or uneasiness in the region of the stomach, it is a sure sign that that organ is in a very bad condition; for St. Martin complained of neither pain nor impaired appetite, but thought all was right, yet everything was wrong; for his stomach was both inflamed and ulcerated; the alcohol had destroyed all sense of pain. Hence, this great delusion.

What may we conclude from these observations? (572-573). What may we conjecture when there is pain after using alcoholics? (575).

LESSON THIRTY-SECOND.

OBSERVATIONS OF DR. SEWELL ON DISEASE OF STOMACH BY ALCOHOL.

576. The proofs that alcohol injures the stomach and other organs and tissues are not confined to ocular demonstration, but also bear evidence of their condition after death.

577. Many years ago the effects of alcohol on the stomach were clearly illustrated by a set of beautiful plates,* prepared for the late Dr. Sewell, Professor of Pathology, and Practice of Medicine, in Columbia College, D. C. These illustrations were the result of observations made by him during a professional career of upward of thirty years, the greater part of these years being employed in pathological researches, or in examining the changes produced on the different organs, etc., by the various diseases.

578. Having, in the course of his researches, many opportunities of inspecting the stomachs of drinkers and drunkards after death, he had plates prepared to represent the various morbid or unnatural conditions of the stomach caused by the use of alcoholic drinks, as he observed them.

579. The first plate represents the interior surface of the stomach in a healthy condition, which was copied from a sketch furnished by Professor Horner, of Philadelphia, one of the ablest anatomists of his age and country. The subject came under Prof. Horner's own observation, and the dissection was made by him. From the Professor's account, the individual was not only healthy but remarkably temperate and regular in all his habits, and was considered by the Professor as furnishing an invaluable standard of a healthy stomach. (See Plate II, fig. 1)

What were the observations of Dr Sewall? (576-577). What is said of the appearance of the healthy stomach? (578-579).

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*These plates have been re-published by the National Temperance Society and Publication House, 58 Reade street, New York. Eight large plates: $12 a set.

PLATE II.

ILLUSTRATIONS OF THE STOMACH.

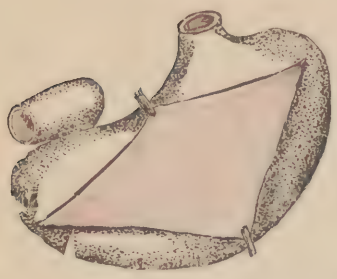

Fig. 1.—Healthy Stomach

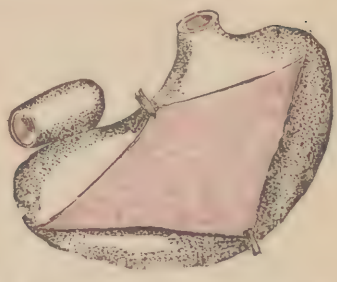

Fig. 2.—Temperate Drinker's Stomach

Fig. 3.—Drunkard's Stomach.

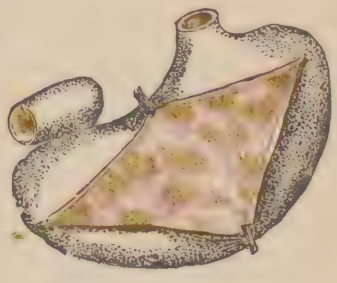

Fig. 4.—Ulcerated Stomach.

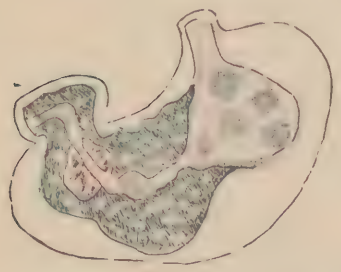

Fig. 5.—Cancerous Stomach.

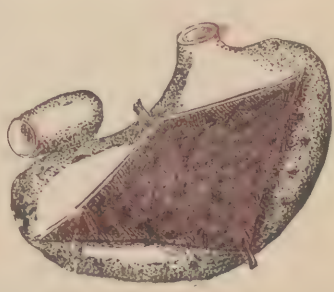

Fig. 6.—Delirium Tremens.

580. It is of a slightly reddish color, tinged with yellow, having something of a mottled appearance, and although supplied with a multitude of blood vessels, which give a pretty blush as upon the cheek of health and beauty, none of them are so large as to be seen by the naked eye. This healthy and natural appearance of the stomach would undoubtedly continue from infancy to old age, if it were acted upon only by appropriate food and drink. Plate II, Fig. 2 represents the internal surface of the stomach of a temperate, or (so called) moderate drinker. The man who takes his glass of some kind of alcoholic liquor in a morning on waking up, or on going to bed as a night-cap; or of him, who takes two or three glasses of wine at dinner, or a few glasses of beer during the day. The work of destruction is shown to have commenced. The beautiful network of blood-vessels, which, as already seen, are invisible in the healtly stomach, by the irritating effects of alcohol, become enlarged, and distended with blood, so that the vessels are now visible and distinct.

581. It is a physiological law, that an irritant applied to any sensitive tissue, induces an increase of blood to that part. The mucous, or inner coat of the stomach is a highly sensative membrane. Alcohol being a narcotic as well as an irritant, as seen (P. 223) it paralyses the nerves, that regulate the dilatation and contraction of the blood-vessels, and as the vessels are no longer under the control of the nerves, they dilate and become surcharged with blood. This condition will be increased by every additional dose of alcohol taken.

582. If, for instance, any irritating substance, or a drop or two of alcohol be placed on the white of the eye, the network of vessels before invisible, becomes distended with blood, and easily seen. If the application should be daily repeated, as the temperate drinker takes his brandy, wine, beer, etc., the vessels become continually increased in size by being distended with blood.

583. Besides dilating and injecting the vessels with blood, the mucous membrane of the stomach becomes thickened, in the temperate drinker.

584. It is the temperate use of alcohol that creates the appetite of the inebriate.

What Physiological law is named? (580-581-582). What is said of the Drunkard's appetite? (584.)

585. By nature man has no more desire or appetite for alcohol than for any other irritant poison. It is as unnatural for man to use alcohol, as it is for a horse or an ox, and no apology offered for its use by man, but can be applied with equal force to any of the lower order of animals.

586. The third illustration (Plate I, fig. 3), represents the stomach of a confirmed drunkard, or the person who has become habitually addicted to the use of alcohol.

587. The blood-vessels, which in the moderate drinker were only slightly enlarged, in this plate are shown to have become so fully developed as to render the most minute vessels visible, like the rum-blossoms (so called) on the drunkard's nose and face. The vessels have become so permanently dilated, that they will retain their unnatural size even after death; unless for sometime previous to that event, the use of alcohol has been abandoned; and nature has had time to restore the vessels to their normal size.

588. After this condition of the stomach has continued for some time, all its coats become hardened, and thickened, and the way is prepared for Scirrhus Cancer or other organic affections.

589. The victim of alcohol arriving at this stage, is never easy, never satisfied unless under the influence of alcohol or some other narcotic When these are withheld, there is loss of appetite, nausea, gnawing pains, and a sinking sensation at the stomach, with debility and disturbance of all the functions of the body. It is when the stomach is in this condition, that the drunkard finds it so hard to resist the craving of his appetite, and reform his habits.

590. Though difficult, reformation, even in this condition, is not impossible. Thousands who had arrived at this point have reformed; and thousands more are undergoing the fearful struggle back to sobriety and health. No one may hope to reform by degrees, or to be cured by substituting one kind or class of alcoholics for another and weaker: as wine for brandy, and malt liquor for whisky.

Has man a Natural appetite for alcohol? (585). How does alcohol affect the drunkard's stomach? (586-587). Describe the stomach? (588). Can persons in this condition reform? (589-590).

591. So long as alcohol is indulged in, even in the least quantity, so long will the desire for alcoholic drinks be perpetuated; and the stomach exhibit traces of disease. Total and entire abstinence, is the drunkard's only safety and cure.

592. It must also be remembered that the susceptibility of the stomach of the reformed is such, that the use of alcohol, in the slightest degree, in any form, and under any circumstances, revives the appetite; when the bloodvessels of the stomach become dilated, and again its morbid conditions are produced. Total Abstinence at once and forever must be the pledge of those who desire to reform. Intemperance is a physical, and a mental disease, as well as a degrading vice, and sin, and as such should, and must be treated.

LESSON THIRTY-THIRD.

DISEASES OF THE STOMACH CONTINUED.

593. The next condition of the stomach to be examined is that of the ulcerated or aphthous conditions of the drunkard's stomach (See Plate II, fig. 4), which often exists, but is not readily apprehended from the obscurity of the attendent symptoms. In this condition numerous small ulcerations extend over the internal coat, usually covered with a white crust producing the *aphthous* appearance. If the crust be wiped off, the mucous surface is found broken and covered with small corroding sores of various sizes, with ragged and inflamed edges; sometimes the inflammation spreads over the intervening spaces.

594, This was the condition of St. Martin's stomach after drinking ardent spirits for several days. Though this was his condition as observed by Dr. Beaumont, yet he complained of only slight tenderness at the pit of his stomach, fully showing the danger of using alcoholic drinks.

Can alcohol relieve this condition, and why? (591). What is the remedy? (592). What is the safety of reformed persons? (592). Describe the ulcerated stomach of the drunkard? (593-594)

595. Another condition of the drunkard's stomach, is that which occurs after a debauch. Represented in the plates of Dr. Sewell, referred in note on Page 152. It was drawn from the stomach of a person, who had been for several days in a state of inebriation, and suddenly came to his death from another cause.

596. The internal coats is shown to have been in a state of high inflammation; and presents several livid spots, with dark grumous blood oozing from the surface.

597. This is a common appearance of the stomach, when inflamed by excessive indulgence in alcohol. This condition cannot be cured by alcoholics, but it must be treated like inflammation from other causes, and particularly by withholding the irritant poisons that produced the disease, and the use of cooling drinks, and a cooling treatment generally.

598. The next condition to be noticed is the CANCEROUS STOMACH (See Plate II, fig. 5) which represents the condition of the stomach of a seafaring man, who was not regarded as intemperate; but was in the habit of taking in the morning a glass of undiluted brandy; and used his grog daily. At length he began to complain of a burning sensation and pain in the region of the stomach.

599. These symptoms were followed by vomiting of food, an hour or two after meals, and subsequently followed by extreme emaciation, and finally death. After death the whole of the stomach, except a small portion at the left extremity was found in a scirrhus condition. Its coats were thickened to the extent of about two inches and the cavity of the organ so closed, as scarcely to admit the passage of a probe from the left to the right extremity. The stomach was shrivelled up, as a blown up bladder would be if scorched by fire.

600. Alcohol had so burned up the stomach, that only a small portion near the cardiac opening was able to digest at all; there was not stomach enough left to furnish nourishment for the body.

601. This man was not in the common sense of the term a drunkard, indeed was never drunk. He took a

Describe the Drunkard's Stomach after a debauch? (595-596-597). Describe the Cancerous Stomach?(598). What are the symptoms and appearance after death? (599-600). Describe this persons habits? (601).

glass in the morning to awake him up, one before dinner to give him an appetite, another after dinner to help to digest it, a glass or two in the evening for friendship and sociality; and lastly another as a night-cap to put him to sleep.

602. Such cases are not rare, three examples were presented a few years ago at the meeting of the Pathological Society in London. I have met at least one if not two similar cases in Philadelphia.

603. After St. Martin had been drinking freely of ardent spirits, his stomach showed signs of the incipient stage of this disease, being covered with ulcerous patches, and yet he made no complaint to indicate the true condition of his stomach; showing that a drinker's stomach may be covered with ulcers, and yet feel no pain, but think that he is well; that all is right, when everything is wrong.

604. The next condition is shown by Plate II, fig. 6, and represents the stomach of the drunkard who dies of delirium tremens.

605. The subject from which this drawing was taken, was a man of amiable disposition, courteous manners and of public life. Although he drank daily, his excessive indulgence was confined to paroxysms of greater or less duration. In several of them he was thrown into a state of delirium, from which he soon recovered.

606. In a paroxysm of longer duration and of unusual severity, his mind was deranged for two weeks, and required two persons to confine him to his room. He imagined his nearest and best friends to be his greatest enemies, and persecutors, and were planning his destruction.

607. He also fancied that spectres, devils, and armed soldiers were entering his room; that deadly serpents crawled over his bed, and wild beasts were ready to devour him. These were succeeded with great debility, cold, profuse, clammy sweat, and small sinking pulse, which were followed by general spasms; when death closed the scene.

608. Let it be clearly understood and remembered that while alcohol makes its first impression upon the stomach,

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Describe St. Martin's condition? (603). Describe the Symptons of delirium tremens? (605-606).

and produces upon that organ the injuries represented, yet its injurious effects are not limited to that organ, but extend to the whole of the intestinal canal, and especially the small intestines. The distant parts are also affected. The liver, brain, heart, lungs and kidneys are seriously injured by alcohol.

LESSON THIRTY-FOURTH.

ALCOHOL: ITS ACTION ON THE LIVER.

609. By the evidence of the living and the dead, we have seen how alcohol treats the stomach, let us now take a glimpse of how it acts upon the liver and some of the other vital organs. As already seen, Dr. Percy, by his experiments, discovered that alcohol accumulates in the liver, which was confirmed by MM. Lallemand, Perrin, and Duroy.

610. We may readily conclude that an agent which produces the injury that alcohol does on the stomach, when it accumulates in the substance of the liver, will not only interfere with its functions, but will seriously mar its tissues.

611. The liver, when in a healthy condition, is a dark red-colored organ, being composed of a vast number of small vessels, containing venous blood. (See Plate III, fig. 1). You have all doubtless seen pieces of liver. It is not homogenous and uniform in structure, as it appears to

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What effects does alcohol produce on the liver? (609-610). Describe the healthy liver? (611).

the naked eye; for when examined by the microscope, it is found to be composed of cells, tubes, and vessels. In fact, it is made up, so to speak, of an aggregation of *small livers*, about the size of a millet seed, connected together by their vessels, and forming a most wondrous network. (See fig. 19).

Fig. XIX.

Fig. XIX.—Section of a part of the Liver, to show a branch of the hepitic vein, with L the lobules, or acni of the liver seated upon the walls and sending their intralobular veins into it.

612. The office, or functions of the liver is to take new substances, not having become blood, and portions of disintegrated matter, that can be worked over again, and make them of use to the system. The liver is, in fact, the economist of the animal body; it excretes *bile*, manufactures sugar, and renews the blood. When the liver is disordered, the whole body is more or less deranged, and its proper nutrition arrested.

613. Alcohol does to the liver what it does to the stomach: irritates, inflames, narcotizes and destroys. Almost the first result of alcohol on the liver is to change its secretion, the bile, from a bright yellow color to a green, and sometimes to a black; and from being a thin fluid, to a substance resembling tar. Alcohol mixing with the tissues of the liver hardens it, so that it becomes, in a measure, dead matter.

614. The liver sometimes becomes full of unabsorbed, dead substance, which forms in spots, and consists of

Describe the function or office of the liver? (612). How does alcohol act on the liver? (613-614-615).

consolidated pus, (see Plate III, fig. 2,) such as is formed under a scab, or is seen when an ulcer is opened, which is usually called matter. These spots, when first seen under the microscope may not be larger than the head of a pin, as at this time only two or three cells are ruptured, but they soon run together.

615. The little spots may be now more plainly seen; for as the inflammation increases, two or more spots unite to form a larger one, when they become larger and larger, until finally the whole liver is changed in color as represented in Plate III, fig. 2.

616. This kind of liver is called the NUTMEG LIVER, because when cut across it has the mottled appearance of a nutmeg. Persons who drink freely of gin or whisky have this *nutmeg* or *gin-drinker's liver*.

617. Enlargement of the Liver, or *Hypertrophy*, is another very common result of the use of alcohol. Sometimes the liver is increased to double its natural size, and very often accompanied by complete disorganization of its structure.

618. The poultry dealers in England and some other countries, being aware that alcohol will produce enlargement of the liver, mix spirits with the food of the fowls in order to supply the epicures with a greater amount of that organ, which is deemed very delicious. Dr. Sewell once met with a liver so enlarged that it weighed from eight to ten pounds, instead of four or five, its natural weight.

619. Inflammation of the liver caused by alcohol not unfrequently terminates in supperation, forming extensive abscesses. I once met a case of this kind in a young German butcher, who said he drank from three to four quarts of lager beer daily.

620. At his death an examination was made, when the liver was found to be in a state of complete *Cirrhosis*, (see Plate III, fig. 3) the hepatic lobules were almost entirely obliterated, and their places were occupied by organized pus. Granular degeneration had also taken place in the kidneys;

What is said of Nutmeg Liver? (616). What of enlargement of the liver? (617-618). How does inflammation of the liver terminate? (619-620).

PLATE III.

ILLUSTRATIONS OF THE LIVER.

Fig. 1.—The Healthy Liver.

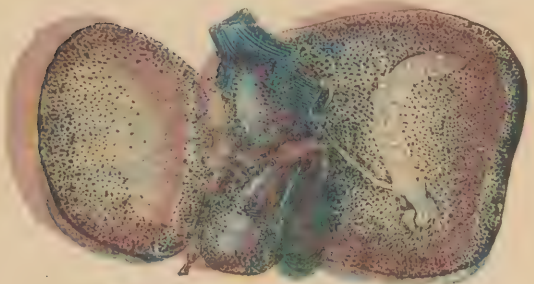

Fig. 2.—Nutmeg, or Gin-drinker's Liver.

Fig. 3.—Cheesy and Tuberculous Liver.

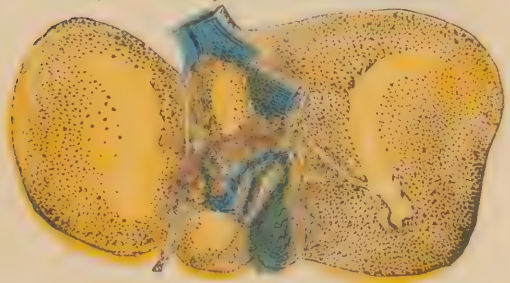

Fig. 4.—Cancerous Liver.

the left kidney presented a high state of congestion, while nothing of the right remained except the cortical (or outside coat) which contained nothing but pus (matter). The spleen was extensively hypertrophied with the appearance of softening.

621. The *gin* or *nutmeg liver* degeneration is not only one of the diseases of the liver by which gin and whiskey drinkers are afflicted, but it is also common among malt liquor drinkers. The coal-heavers of London, a class, who drink immense quantities of ale, porter, etc., are subject to this condition of the liver, and seldom live to an advanced age; for notwithstanding that they have the appearance of physical giants, they die usually early in life.

622. George Frederick Cook was not only distinguished as a great tragedian, but also for his drunkenness. When he died in New York, he was opened by Dr. Hosack, who found that while the liver was diminished in size, it was so hard that it offered considerable resistance to the knife; and was also much lighter in color than natural.

623. The whole substance was covered with tubercles, and the blood vessels which are large and numerous in a healthy liver, were entirely obliterated, so that the circulation had nearly ceased long before his death. According to Kohliker, alcohol breaks up the bile secreting the cells; and by its stimulating effects fills them up with granular matter. As a consequence of this *altered bile*, the blood is not properly purified or relieved of its waste or fatty matter, which is often more than 100 parts per thousand in the blood, in place of 2 per thousand its normal quantity.

624. Another disease liable to follow the use of alcohol is the Cheesy and Tuberculous Liver, (Plate III, fig. 3). Dr. Hopes (Morbid Anatomy) gives a very interesting case. This was the case of a cab-driver addicted to drinking. The tubercles first appear as individual spots of disease (acini), then they coalesce, and finally are formed as a compact mass. This liver was five times its natural size, and crammed with thousands of tuberi varying from the size of a grain of rice to that of an egg.

What causes nutmeg liver? (621). Of what did George Frederick Cook die? (622-623). What is said of cheesy, tuberculous liver? (624).

625. The disease of this organ commences at first with slight irritation, and ends in complete destruction. It may easily be comprehended that an organ of such size and importance cannot safely be irritated day after day, without seriously injuring and maring its functions, as well as working injury to the whole animal economy.

626. Drs. Peters, Goldsmiths and Moses, conjointedly examined seventy bodies to observe the effects of alcohol, and found the *livers* of *moderate drinkers* were *larger* than *natural*, somewhat *softened*, and their external surface spotted with *fatty infiltration*, extending nearly a quarter of an inch into the texture of the organ.

627. In *old drunkards* the liver was *very large, weighing twice* and sometimes *thrice their natural weight, white, fat*, and *soft*. From the observations of Drs. Beddoes, Trotter, and others: the faintest sign of indigestion in those who drink fermented liquors, may serve as a sure indication that something is wrong with the liver.

628. In cases ot chronic diseases of the liver by alcohol, as in the stomach, there is frequently no alarm given until some incurable affection sets in. Hence the fallacy and danger of a man judging merely by his feelings the beneficial or injurious effects of intoxicating drinks.

629. For by narcotizing or paralysing the nerves, the liver, like the stomach, may be very seriously diseased by alcohol, and the person all the time imagine himself in moderate or good health.

LESSON THIRTY-FIFTH.

THE EFFECTS OF ALCOHOL ON THE KIDNEYS.

630. The function of the kidneys is to excrete *nitrogen* from the blood in the form of *Urea*, and some other substances that have become waste or effete matter.

What of the cancerous tubera of the liver? (625). How does disease of the liver begin? (626). What were the observations of Dr. Peters, etc.? (626-627). What the observations of Trotter and Beddoes, etc.? (627-628). How does alcohol affect the liver? (629). What is the office of the kidneys? (630).

PLATE IV.

ILLUSTRATION OF THE KIDNEY.

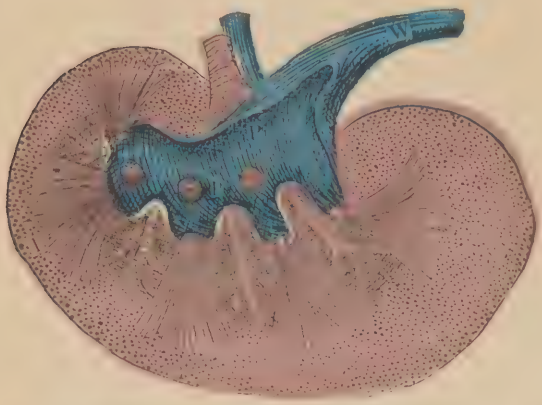

Fig. 1.—The Interior of the Kidney in a healthy state. W the Ureter P the bowl of the Pelvis, laid open, showing the papillæ p projecting into this cavity; B the curtical substance.

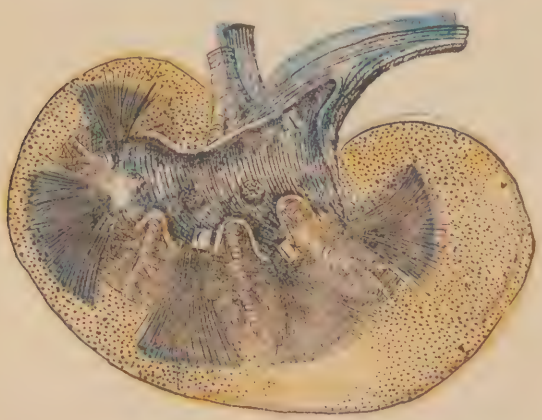

Fig. 2.—The Granulated Kidney of the drunkard, being pale, softened, and enlarged. A the Pelvis, with the three branches; B C D leading to the cones.

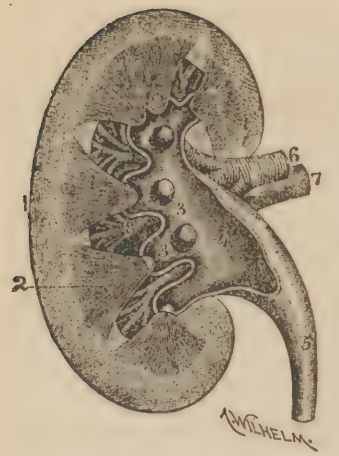

Fig. XX.

Fig. XX. (Leidy) Longitudinal Section of a kidney.—1, Cordical Substances. 2, Renal pyramid. 3 Renal papillae. 4, Pelvis. 5, Ureter 6, Renal artery. 7, Renal vein. 8, Branches of the latteral vessels in the sinus of the kidney.

631. These organs are very seldom found in a healthy condition after death, in the drunkard, or even the moderate and regular drinker of alcoholics. For their temperate use (so called), frequently leads to most difficult and even fatal diseases. From three-fourths to four-fifths of the cases of kidney disease met by Dr. Christison, in Edinburg, Scotland, the subjects were habitual drunkards, or persons though not deserving that name, used spirits habitually several times a day. According to Dr. Carpenter, the experience of physicians in English hospital practice is precisely the same.

632. It is not surprising, that the kidneys should become thus diseased, when we consider that these organs are excited to increased action in order to eliminate, or expel the alcohol from the circulation. Yet the effects of this agent do not fall on the kidneys, so directly as on the stomach and liver; as the blood of the kidneys is derived from the arteries in which the alcohol is more diluted.

633. Yet notwithstanding this fact, the habitual use of alcohol produces irritation, which passes to chronic inflammation and alteration of the structure. Hence the origin of Bright's disease or the granular degeneration of the kidneys.

634. This disease is not often met with in private practice, unless the patient has habitually used malt liquors, gin, or whisky; for these drinks, having a strong diuretic tendency are apt to produce great temporary excitement and activity of the kidneys, tending to produce chronic irritation.

Are they healthy condition in drunkards, etc.? (631). Why do the kidney's become diseased? (632). What is said of Brights disease? (633-634).

635. But if they should excape this form of disease, the long and continued excitement upon them will impair their functions; for persons advanced in life who have habitually used these drinks, are very apt to be afflicted with gout, rheumatism, and other diseases arising from insufficient elimination of the morbid matters from the system.

636. The over-excitement of any organ will be followed sooner or later, by depression of its functional power. The irritation produced by alcohol tends to produce perverted nutrition, thus rendering the kidneys unable to rightly perform their functions. Hence alcoholic drinks not only injure the stomach and liver, but are among the chief causes of disease of the kidneys.

What other diseases are caused by alcohol? (635). What are the effects of over-excitement? (636).

CHAPTER X.

ALCOHOL: ITS EFFECTS ON MIND, ETC.

LESSON THIRTY-SIXTH.

THE STRUCTURE OF THE BRAIN, ETC.

637. We have seen (L X) that the nervous system consists of two portions: the *Cerebro-Spinal axis*, and the *sympathetic system*. The *Cerebro-Spinal axis* is composed of two equal and symmetrical halves or parts, and consists of the brain and spinal cord. The brain fills up the entire cavity of the head, and is enclosed in the bony case of the skull. It consists of white and gray nervous matter, and is divided into two halves, by a deep fissure called the *great longitudinal fissure*, (see Fig. X) running in a direction corresponding from the forehead to the back. Below the fissure, each half is in intimate union with its fellow, and appears to form at the base of the organ, a single mass.

638. Each hemisphere, or half of the brain controls or presides over the *motions* and sensations of the *opposite* side of the body: by the decussation or crossing of the nerve fibers (see fig. VII) in the medula *oblongata*, (see fig, X–1) the fibers from the left side of the brain cross over to the right side of the spinal cord, and preside over the motions and sensations of the right half of the body; and those of the right side cross over to the left, and preside over that half of the body.

639. The surfaces of the brain are arranged in a series of folds or convolutions of gray matter. (see fig. X) These convolutions are formed in regular order, and are believed

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How is the Brain Substance arranged? (637). What effect has disease or injury of the right side of the brain on the left side of the body, etc.? (638) Why is this? (639). How are the surfaces of the brain divided? (639). Describe the convolutions? (639). Describe the membranes and blood-vessels of the brain? (639-640).

to be endowed with separate and special functions. The brain within the skull is covered by several membranes. The outer one is a tough dense, covering, called the DURA MATER, which loosely surrounds, and protects the brain from injury, and serves to attach it at several points to the skull. Within this is a finer and more delicate membrane called PIA MATER. This membrane closely invests the convolutions, and dips down into the divisions or *Sulci* (as they are called) between each convolution, and also penetrates into the centre of the brain by numerous fine apertures.

640. These membranes contain, running through them, a vast network of bloodvessels. Those in the DURA MATER convey dark colored or venus blood from the brain to the heart; and the scarlet or arterial blood is carried by the vessels of the PIA MATER to the brain. The latter vessels are much more numerous than those of the DURA MATER; and by the microscope are seen to be curving and passing in every direction, and present a most beautiful appearance. From the PIA MATER great numbers of little vessels pierce the brain substance, running in channels, and supplying every portion of its structure with blood to nourish, and to keep it in a healthy condition, and to sustain its normal actions. Each of these little bloodvessels, on entering the substance of the brain, runs down into it, and then divides into smaller branches, and these again into still smaller twigs, until they become so minute and intricate that they are finer than the finest hair, and are called *capillaries;* and being as already described (L), composed of elastic tissue, are capable of expanding, and thus allow at one time a large quantity of blood to pass to the brain; and to contract at another, and therefore to diminish the supply. As already seen (L X) this power of expansion and contraction of the vessels is due to the influence of the minute nerve fibres, which traverse the walls of the vessels; and also that the irritating and paralysing action of alcohol increases the size of the bloodvessels to an unnatural extent.

641. It has been seen (L X) that the substance of the brain and nervous system is composed of white and gray matter; and that the convolutions and the ganglia or

Describe the gray matter? (641). Describe the nerve corpuscles?(641)

nerve centres are gray substance. This gray substance in the cerebellum, (see fig. X–5) presents an arborescent appearance. To the naked eye both kinds of brain substance seem homogeneous material with only thin wavy lines running through the gray matter dividing it into layers or strata. When examined by the microscope the gray matter is found to be made up of layers, one on the other like leaves of a book, and each layer contains numerous minute vessels, with innumerable vesicles or bodies, of a rounded, oval, or triangular shaped outlines, and are called nerve corpuscles. (see fig. VIII) Though these bodies are very small, they are very important. They lie in rows in each layer, the rounded ones being in the upper layer, while the larger and triangular shaped are lower down; the pointed extremities of the latter being toward the surface of the brain, and the broad ends, or bases towards the white matter (see fig. IX). From each of these angles little tail-like fibres project, and in the largest corpuscles, these little fibres themselves divide into two or more processes as they are called, until the corpuscles with its processes look somewhat like a spider. A powerful microscope will show that these corpuscles are associated with each other by their projections or proposses, and form a complex network. Each compuscle contains a darker spot called a *nucleus* or *centre;* and this contains another but smaller spot, called the *nucleolus* or *centre* of the *centre.* These corpuscles and bloodvessels are inbedded in a most delicately fine substance, called *neuroglia.* Thus the gray nerve matter consists of *bloodvessels*, *nerve corpuscles* and *neuroglia.*

642. The white nerve matter consists of numerous fine rods, or nerve fibres, that lie in juxtaposition, each remaining distinct from its origin to its termination, like the strands of wire in a telegraph cable, and are surrounded and supported by a material similar to that in the gray matter. This covering or sheath is called *neurilemma*, (see fig. VII) in which there are bloodvessels for the nutrition of the nerves. As already said (P. 229), the gray matter originate nervous force, while the white fibres transmit it. Bundles of these nerve fibres are collected

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Describe the white nerve fibres? (642),

together at the base of the brain, and run down in the spinal cord, thence as nerves to the different muscles and and portions of the body to produce its various motions; and as already said (P. 209), the nervous system resembles an electric apparatus, etc. Having given an outline of the structure of the brain, we will as concisely as possible describe some of the effects of alcohol on that organ.

ALCOHOL: ITS ACTION ON THE BRAIN.

643. Perhaps the most serious results produced by alcohol are its actions on the brain, and nervous system generally. At this we cannot be surprised if we consider its most intricate and delicate structure, and the wonderful operations of the human mind. From what we know of the actions of alcohol on other structures of the body, we cannot but conceive that it must inflict upon the fine, delicate structures of the brain, serious alterations of its tissues, and mar its functions.

644. The first effects of alcohol are on the vascular network, or bloodvessels of the membranes covering the brain. On passing from the stomach into the blood, it is rapidly conveyed in the circulation, to the vessels of the brain; it acts on the minute nerves controlling the bloodvessels, when they become relaxed and are quickly distended with blood, and hence a greater quantity of blood loaded with alcohol passes into the brain substance, which has, as already seen a special affinity for its colloid.

645. The result of this increase of blood is temporary excitement of functional activity; when the ideas flow faster than natural, which is followed by gaiety, etc., and is the first stage of intoxication. More alcohol being imbibed, functional activity is still further increased, and if the imbibation be continued, the increased flow of thoughts and fancy is succeeded by delirium, when the vessels have become filled with alcohol to their utmost extent.

646. Now the blood begins to be impeded in its way out of the brain; the vessels have become clogged, (see Plate V, fig. 4), and as a consequence contain unchanged blood, or blood loaded with carbonic acid, which unfit it

What are the effects of alcohol? (644-645-646-647).

PLATE V.

ILLUSTRATIONS OF THE BRAIN.

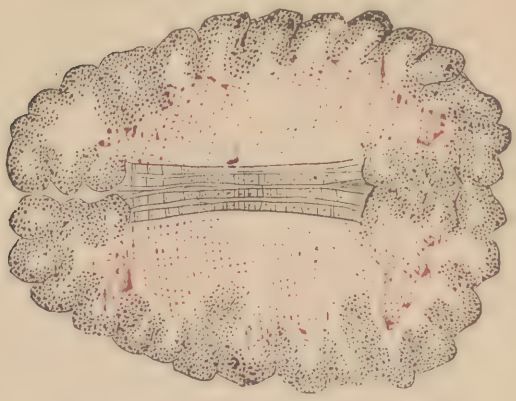

Fig. 1.—Natural Condition of the Brain.

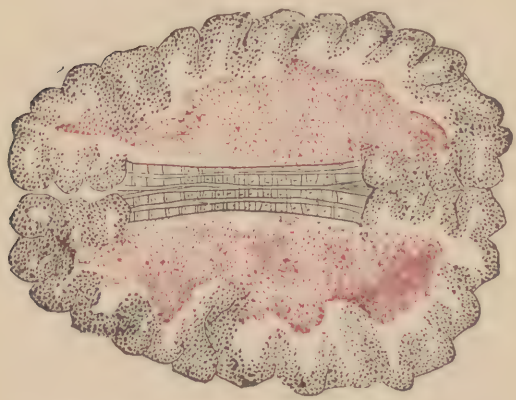

Fig. 2.—The Brain Inflamed by Alcohol.

Fig. 3.—Membranes of the Healthy Brain.

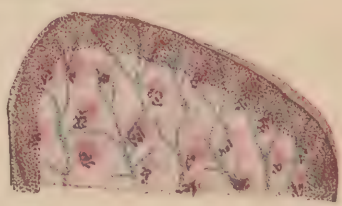

Fig. 4.—Membranes of the Brain Congested by Alcohol.

for to nourish the brain. The nerve corpuscles are therefore deprived of nutriment, and fail in their power; when the memory becomes dimmed; speech affected; motion and sensation impaired, and finally all physical and mental action is overpowered by sleep or stupor.

647. During this stupor, the alcohol gradually escapes from the vessels, a portion out of the body, while some of it becomes absorbed by the brain tissue; for as already shown, alcohol has special affinity for the brain substance. The blood-vessels partially resume their natural size; and after a time, their natural condition is in some degree restored, though a sense of depression, dullness, and lacitude still remains, which shows that the fatigued brain substance is unable to supply its impulses with the activity that it did before the alcohol was imbibed. It is a question if a thoroughly alcoholized brain is ever in the same healthy condition it was before that event.

648. Should this condition of vascular excitement, or dilatation of the blood-vessels be often repeated, the Dura Mater (see Plate V, fig. 4) becomes thickened; the result of inflammatory exudation, and the deposit of inflammatory products in its tissues, while the overloaded blood-vessels also undergo a change in their structure. After death the dura mater is often found adhered to the skull; and the pia mater, which is normally delicately fine and transparent, is often found to be opaque, and coarse in texture, and to be also adhered to, or as if glued to the convolutions by some material of inflammation. The little vessels by constant over-distension lose their contractility; and become so twisted in their course, and thickened in their coats, that the blood cannot easily flow through them.

649. They sometimes become so brittle by the change of their structure, that they are liable to burst under some excitement or extreme pressure; when the blood flows into the tissue and destroys its functions, (see Plate V, fig. 2) and produces apoplexy, a calamity that often ends the drunkard's career. Alcohol also causes death suddenly not only by apoplexy, but by congestion of the brain, coma, and frequently paralysis of the heart.

What are the results or these actions? (648) What of their continuation? (648) What causes apolexy? (649).

650. We may easily understand that such an agent even in (the so called) moderate quantities taken regularly, will, by a slow process of depriving the tissues of nutrition, cause a *degeneration* of the nerve corpuscles, when their little processes break off and melt away, and their bodies shrivelled up, and lose their functional activity or power.

651. By its astringent property alcohol hardens the entire brain, so that its substance becomes disintegrated and softened, which is doubtless due to the inability of the blood to pass through the obstructed vessels in order to nourish the tisssue.

652. Such are some of the effects of alcohol on the brain. It attacks the very citadel of the mind; lays siege to the watch tower of the soul, and interferes with the highest and noblest faculties of man. From its actions on the brain substance, we need not wonder at the noble minds overthrown; the intellect blasted of the brightest and the best in the land; that geniality and kindness give place to maroseness and cruelty; that the *will* is weakened and all the finer feelings are blunted; that the memory should fail, and the intellectual giant becomes a gibbering, babbling imbecile, or raving maniac; and that entire paralysis of mind and body should sometimes result from the use of this terrible degenerating poison of body and soul.

LESSON THIRTY-SEVENTH.

ALCOHOL AND MENTAL DISEASES.

653. If we take into consideration the delicate structures of the brain, and the action of alcohol on its vessels, membranes and tissues, we can readily apprehend how, that not only apoplexy, epilepsy and hysteria, but that many other mental diseases are either caused or induced by alcohol. Nor are they the result of ardent spirits only. Dr. Macnish said that seven out of ten malt liquor-drinkers die of

How does alohol act as an astringent? (651). Give the general remarks? (652). What did Dr. Macnish say? (653).

apoplexy or palsy. It is not really necessary that they should be drunkards, according to the general acceptation of the term, as it is sufficient to produce these results if large quantities of ale and beer are daily used.

654. Intoxicating drinks, it may be safely affirmed, produce more insanity than any other known cause, not even excepting hereditary predisposition; for hereditary insanity is often itself the result of alcoholic drinks. Magnus Huss, after describing the causes of alcoholism, and the production of convulsions by alcohol, says: "If the use of alcohol is continued the convulsions may degenerate into epilepsy. Alcoholic epilepsy may degenerate into general paralysis, or it may be cured if the use of the liquor be stopped. (See Plate of the brain).

655. These experiences of Magnus Huss are daily verified in every poorhouse and hospital, as well as in private practice in the cities of this and other countries, though perhaps not so frequent in the rural districts. Cases of delirium tremens are not confined to men, nor to hovels and shanties, for they are met among refined and cultivated ladies, occupants of brown-stone mansions and marble halls. Drunkenness, and diseases resulting from alcohol, are not unknown among women; nor is it now a rare case for ladies, when they leave the gentlemen to their wine, brandy, etc., to retire to the drawing-room and cheer themselves with alcoholic cordials and tonics, (so called).

656. By the testimony of Lord Shaftsbury, fifty per cent. of the insane sent to the lunatic asylums in England, are due to strong drink. Of the admissions of the insane in the Paris hospitals during the late war in France, fifty-six per cent. were due to alcohol. From two-thirds to one-half of the insanity in the United States is doubtless due directly, or indirectly, to alcohol. It is very certain that persons in whom the nutrition of the brain is disordered by the use of alcoholic beverages, are more liable than others to the moral and physical causes to which insanity is attributed. As the use of alcoholic liquors weakens the mental stamina of parents; they transmit still weaker mental and physical organization to their offspring.

657. "It is certain, however," says Dr. Maudsley, "that

What may be affirmed of intoxicating drinks? (654). What said Dr. Magnus Huss? (654). What is said of delirium tremens? (655). What said Lord Shaftsbury? (656). What says Dr. Maudsley? (657).

lunatics and criminals are as much the manufactured articles, as are steam-engines, calico, and printing machines, only the processes of the manufacture are so complex that we are not able to follow them." The insanity resulting from the use of alcohol is manufactured not only by ardent spirits, but by malt liquors and wine, for the manufacture of which society and individuals are responsible. "When men," says Dr. Maudsley, "take careful consideration of the best use they can make of their bodies and minds they will never take alcohol in any form as a beverage, even if they take it as a medicine in very rare cases." I am not able to say what these rare and particular cases are, as the more I study the subject, the less use I see for alcohol even as a medicine. But be that as it may, it is sheer folly at this day to say that there is any real necessity for persons to use intoxicating drinks who are in health. At the best, it is an indulgence that is unnecessary, and at the worst, it is a vice from which flows infinite misery, sin, crime, disease, madness and death. "Each crime, each outbreak of madness, each suicide, each disease, and each death, caused by strong drink, before reaching that climax, was proceeded by an infinite amount of suffering inflicted and endured."—Maudsley.

ALCOHOL: ITS EFFECTS ON PROGENY.

658. Though we may be able to approximately estimate the influence of drinking habits in the production of vice, pauperism, crime, and insanity, we have only imperfect knowledge of the waste of human energy and material; while it is utterly impossible to calculate the moral, mental and physical evils produced by them. The results of alcohol, most overlooked, because the least plain, are the amount of disease, weakness and imbecility transmitted from parents to children. As a rule, children inherit the passions, diseases, etc., of their parents, and even when the inheritance does not present itself in absolute disease, it often appears in defective mental and physical organization, and this defect or feebleness predisposes to intemperance as well as disease. To say nothing of the

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What is said of poverty, etc.? (658). What do children inherit, etc.? (358)

direct expense annually in the United States of $700,000,000 for intoxicating drinks, nor that indirectly resulting from their use, which no one can really estimate, it is certainly a crime of the deepest dye for any state to authorize the sale of an article that destroys the minds of men and women, and converts them into imbeciles and maniacs. Thus society sows the seed and must consequently reap a harvest of insanity and idiocy, which is entailed upon the children of the users of intoxicating drinks often to the third and fourth generation.

659. Intemperate parents not only injure, degrade and ruin themselves, but transmit the same to their offspring. It is as well established as any fact in nature and physiology, that the children of the intemperate are often physically and mentally weak, and are predisposed to their own vices.

660. The use of intoxicating drinks, short of drunkenness, often produces a predisposition to intemperance, to mental and physical diseases, when a continuance of the use of these drinks will transmit from generation to generation a feebleness of purpose, dullness of intellect, or imbecility, with tendencies to vicious habits, and the general deterioration of the race. This can be exemplified everywhere. It may be witnessed in every race and country, and there is no large city but presents numerous illustrations. The criminal and dangerous classes (so called) of every country are of this class, the vast majority being but feebly organized, mentally or physically.

661. M. Morel, the distinguished French author gives the history of four generations of a family.

First generation—The father was an habitual drunkard and killed in a public house brawl.

Second generation—The son inherited his father's habits, which gave rise to attacks of mania, terminating in paralysis and death.

Third generation—The grandson, though strictly sober, was full of hypochondriacal and imaginary fears of persecutions and homicidal tendencies.

Fourth generation—The fourth in descent had very

What is said of intemperate parents? (659). What effect has the free use of alcohol? (660). What is said of criminals, etc.? What did Dr. Morel give? What do we find in that family? (661).

limited intelligence, and had an attack of madness when sixteen years old, terminating in stupidity nearly amounting to idiocy. In this family we not only perceive the persistence of the taint, but that even a generation of absolute sobriety did not avert the terrible and fatal issue.

662. By the testimony of the superintendents of lunatic asylums, before the Committee of the Lower House of the Convocation of Canterbury, England, the proportion of idiocy from the use of alcoholic drinks is not less than fifty per cent. This is the estimate of the cases known, while the number of unascertainable idiots, imbeciles, etc., offspring of intemperate parents must be added. Dr. Howe, of Massachusetts, in 1848, estimated that three-fourths of the idiots born are the offspring of intemperate parents. The Commission on idiocy, appointed by the Connecticut Legislature, in 1856, stated that out of two hundred and thirty-five cases, as far as ascertained, seventy-six, or thirty-two and three-tenths per cent. were due to parental intemperance.

663. M. Lunier, of France, estimates that fifty per cent. of the parents of idiots and weak-minded children are notorious drunkards. He further says, that the majority of children born of parents when drunk, or who are constitutional drunkards, are weak in some way or other. Numerous cases proving this point might be presented, but one or two must suffice. In Suffolk, England, two cousins married and lived on a small property. They were usually muddled with drink; not often what is commonly called drunk; but always more or less under the influence of alcohol. They had five children, who were idiots of the worst class; that is, they were not only defective in intellect, but inherited from their senseless parents an excess of animal propensities.

664. The wife of an amiable clergyman, of S——, in Staffordshire, England, was so addicted to drunkenness that she had frequently to be carried to bed. Every effort of the distressed husband failed to reclaim her. Death at last prematurely cut short her career. She was the mother of three idiotic children.

What testimony of asylums is given? (662). What is M. Lunier's testimony? (663) What is said of the Suffolk cousins? (663). What of the clergyman's wife? (664).

665. Dr. Winslow examined the statistics of a single family, and found that there was in that family a father a drunkard, a grandfather a drunkard, and a grandmother an idiot. There was in the line of that family drunkards, criminals, idiots and all forms of vice, which were hereditarily transmitted and traced to the use of alcoholic drinks.

666. Dr. Anstie, before the English Committee in Parliament on Habitual Drunkards, said: "The tendency to drink is a disease of the brain which is inherited. When drinking has been strong in both parents, I think it is a physical certainty that it will be traced in the children. I have no doubt that many persons who were *never* drunk in the old port wine drinking period, have transmitted very unstable nervous systems to their children.

667. Dr. Mitchell, to the same committee said: "He was quite certain that the children of habitual drunkards were in larger proportion idiotic than other children, and in larger proportion themselves habitual drunkards, they are also in a larger proportion liable to the ordinary form of acquired insanity, or that insanity which comes on in later life; * * that many habitual drunkards are strongly predisposed to insanity."

668. Dr. Darwin, in his "Botanic Garden," published 1794 (in a note to canto iii,) said: "The swallowing of drams cannot better be represented in hieroglyphic language than by taking fire into one's bosom; and certain it is that the general effect of drinking fermented or spirituous liquors is an inflamed schirrous, or paralytic liver, with its various critical or consequential diseases, as leperous eruptions on the face, gout, dropsy, epilepsy, insanity." It is remarkable that all the diseases from drinking spirituous or fermented liquors are liable to become hereditary, even to the third generation, gradually increasing if the cause be continued, till the family becomes extinct." A host of scientific men of the present time confirm this testimony, among whom are Dr. Down, Dr. Richardson, M. Jaquet, M. Rousel, and others already quoted.

669. Dr. Norman Kerr, in a paper read before the

What is Dr. Winslow's testimony? (665). What did Dr. Anstie say? (666). What is Dr. Mitchell's testimony? (667). What is Dr. Darwin's testimony? (668). Give the cases reported by Dr. N. Kerr? (669).

"International Congress" at Brussels, August, 1880, gave the case of "a gentleman of position, sixty-four years old, who is an hereditary drunkard. * * One of his sisters (unmarried) is an imbecile through drinking, and has often tried to commit suicide, when drunk, by hanging, by poison, and jumping from a window. Her insanity has so suicidal a tendency that she cannot be left for a moment alone. She will do anything for drink; will beg, borrow, steal, pawn everything she can lay her hands on. Another sister (married) is also an habitual drunkard, who has fits of ungovernable fury when in drink, and being dangerous to herself and others is under restraint. Thus all the family are *dipsomaniacs*. The fatal legacy in this case was from both parents. The father shot himself when laboring under alcoholic mania, and the mother was an inveterate drunkard. The grandfather was also a confirmed drunkard." There is nothing more sure than that intemperance, insanity, idiocy, and many diseases may be and are transmitted to the children of the intemperate to the third and fourth generation.

LESSON THIRTY-EIGHTH.

ALCOHOL: EFFECTS ON PROGENY—CONTINTED.

THE JUKE FAMILY.

670. The effects of alcoholic drinks and their transmitted evils, are clearly exemplified in the history of this family. In ——— county, N. Y., six persons of four families were found, whose lineage reached back to some early colonists who had intermarried so slightly with emigrants that they may be justly called an American family. They had lived in the same locality for generations, and were so despised by the reputable citizens that the name of the family was used as a reproach. That the reproach was well deserved every one will acknowledge when they learn that of twenty-nine adults, males, from the ages of fifteen to seventy-five,

What does the history of the Juke family show? (670). For what were the persons of this family noted? (670).

the immediate blood-relations of these six, seventeen were criminals, or fifty- eight per cent., and that fifteen were convicted of some degree of offence and received seventy-one years of imprisonment.

671. The origin of this family—the Jukes—the first generation was a man to be called Max, who is described as a hunter, and fisher, and hard drinker, and became blind in his old age, which blindness was entailed on his children and grand-children. He had numerous children, some of them illegitimate it is almost certain. Two of his sons married two out of six sisters, who were born between the years of 1740 and 1770. The progeny of five of these sisters has been traced through five generations. The number of descendants were five hundred and forty, who were directly related by blood, and one hundred and sixty-nine related by marriage or cohabitation; in all seven hundred and nine persons of all ages alive and dead; while the total estimated lineage is about twelve hundred; the dispersions that have occurred prevent the following up of many of the lateral branches.

672. From the estimated result, of seven hundred persons, one hundred and eighty have either been in the poor-house or have received relief to the extent of eight hundred years, allowing that the best members of the family have emigrated, it would be a low estimate to say that eighty of the additional five hundred, are, or have been dependent, adding three hundred and fifty years to the relief, making an aggregate of two hundred and eighty persons under pauper training, receiving eleven hundred and fifty years of public charity.

673. Nor is this all, for of the pauper records of two hundred and twenty-five years, only sixty-four years could be consulted. If the one hundred and ninety-one would yield as many years relief as the sixty-four, actually searched, there would be an aggregate of twenty-three hundred years of relief. Allowing one hundred and fifty years of almshouse relief, at one hundred dollars a year, equals fifteen thousand dollars, twenty-one hundred and fifty years of out-door relief at fifteen dollars a year, equals

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Relate the origin of this family? (671). Give their number, and years of public charity? (672). What did they cost the counties for pauperism? (673-674).

thirty-two thousand two hundred and fifty, or an aggregate expenditure of forty-seven thousand, two hundred and fifty dollars in seventy-five years for this one family, fifty-two per cent. of whose women are harlots in some degree.

674. From what could be ascertained of the history of this single family, of twelve hundred persons, there was a loss in seventy-five years, of one million dollars; not counting the money paid for intoxicating drinks, nor taking into account the entailment of pauperism and crime of the survivors of the next generation, nor the incurable disease, idiocy and insanity arising from their debauchery, which may extend to the third or even the fourth generation.*

675. A paper on "The Intemperance of Parents, a Predisposing Cause of Imbecility of Children," was read by Fletcher Beach, M. B., M. R. C. P., in the Psychology Section of the British Medical Association at Cambridge, England, August 11, 1880. Dr. Beach is Medical Superintendent of the Darenth Asylum, Kent, and has had opportunities for investigation. We learn that after five years of inquiry of the friends of his patients, he has obtained the histories of four hundred and thirty out of eight hundred and eighty. Of these four hundred and thirty patients, one hundred and thirty-three had intemperate parents, or an average of 31.6 per cent. And two others had sober parents but intemperate grandparents.

676. Of these one hundred and thirty-eight cases, seventy-two were males and sixty-six females; and ninety-one cases were congenital, and forty-five were acquired. In all the congenital males, the fathers were intemperate; of the twenty-five acquired males, twenty-three had intemperate fathers, and one an intemperate mother. In the remaining case the father was sober, but the paternal grandfather was intemperate. Of the forty-four congenital females, forty-two had intemperate fathers, one an intemperate mother, and in one the father and mother were both intemperate. Twenty-one of the twenty-two acquired cases of females had intemperate fathers, and the twenty-second had an intemperate paternal grandfather.

What do we learn from Dr. Beach's paper? (675). Describe the parents of the congenital and acquired cases? (676-677).

*See the Thirtieth Annual Report of the Executive Committee of the Prison Association of New York, 1874, pp. 139–192.

677. These facts indicate that intemperance is far more common on the male than on the female side. Then again it was found that of the forty-seven intemperate fathers of congenital males, forty-five were occasional drunkards, one was a hard drinker, and the other died of delirium tremens; and of the twenty-three intemperate fathers of the twenty-five acquired males, twenty were occasional drunkards, one was a hard drinker, and one died of delirium tremens, and one of the effects of drink; in the remaining cases, the mother of one was an occasional drunkard, and the paternal grandfather of the other was very intemperate. Of the forty-two intemperate fathers of congenital females, thirty-eight were occasional drunkards; two very intemperate; two had had delirium tremens, and one died of it. In the two remaining cases, the mother of one was drunk during the whole period of pregnancy; and in the other both father and mother were intemperate, and the father, it is said, became insane by drink. Of the twenty-one intemperate fathers of the twenty-two acquired female cases, eighteen were occasional drunkards, two very intemperate, and one a very heavy drinker. The paternal grandfather of the remaining case was very intemperate.

678. These figures show all degrees of intemperance from the occasional drunkenness to delirium, and one fact worthy of particular note, is that the vast majority of the fathers were only occasional drinkers or drunkards; showing that it is not necessary to produce imbecile children that the parents should be confirmed or habitual drunkards, but that occasional drinking or drunkenness is sufficient to produce this terrible affliction to parents, and the immense cost of idiots to the State

679. Dr. Beach found that in a few cases drunkenness was the family failing. In three cases the fathers side are described as intemperate, and in one of these cases the father's side of the family had been intemperate for many generations. In one case only, was the mother's side given to drink, but in this the result was very marked, for not only was the patient in the asylum, but her two cousins were also imbeciles. In four cases the parternal

What do these figures show? (678). What is said of drunkenness as a family failing? (679).

grandfathers were drunkards; in one the maternal grandfather; in two cases the grandfather and grandmother both drank; In one case a paternal uncle, in one a paternal aunt, and in one a maternal aunt was intemperate. In some cases the effects fell on the grandchildren, the father of two patients were sober men, but the paternal grandfathers were intemperate.

680. Dr. Beach says: "In seven cases they were the only children born, and one of them was born after fourteen years of marriage. In one case the mother was married ten years before the child was born, in another the mother had only two children during twenty-one years, and both were imbeciles." In forty-seven of the ninety-one congenical cases, and forty of the forty-seven acquired cases, convulsions or epilepsy complicated the imbecility. This most valuable paper shows very clearly the effects of alcohol in the production of imbeciles; and there is nothing more certain than that intemperance, insanity, idiocy, and other mental defects as well as diseases, may be, and are often transmitted to the children of the intemperate, to the third and fourth generation.

LESSON THIRTY-NINTH.

THE HEREDITARY EFFECTS OF MODERATE DRINKING.

681. While the hereditary results of the regular, or so called moderate use of intoxicating drinks are not so clearly seen as habitual intemperance, yet there are a sufficient number of cases to show the degenerating and injurious effects of alcohol upon the beginning of life of the offspring of moderate drinkers; thus entailing upon them, mental and physical weakness, and often idiocy, or constitutional craving for narcotics, and a tendency to become intemperate. "It is not long since" says Dr. F. R.

What are the complications caused by intemperance? (680). What does Dr. Beach's paper show? (680). What said Dr. Lees of the effects of alcohol? (681).

Lees, "that a tall, stout man now happily a reclaimed man, invited me to his house. He had had thirteen children and only one was living. 'Doctor' he said, 'how is it that all my children have died of decline when young? None of them reaching more than twenty. My wife wasn't an unhealthy woman, and see how stout I am.' I asked a question and saw at once. He had been for many years an excessive drinker. He had a giant's constitution which apparently prevented him from being destroyed, but drinking had injured the beginning of life, so that he transmitted a corrupted type to his children. He was saved for a while by reason of his strength, while his children perished." Numerous cases like this might be given. Almost every physician could give like cases if they reflect and make a few inquiries.

682. But as Dr. Lees says:—"Doctors themselves are blind on this point. Lecturing some years ago, and taking supper afterwards with some of the chief persons in the town—three or four doctors and two lawyers—a doctor said he thought I exaggerated the matter. I said why do you think so sir? 'Oh,' says he 'we have such cases of free drinkers, who nevertheless are in good health.' I said have you any particular person in view? I have Mr. W. a friend of mine. Only the other day he told me he had drank at least a bottle of wine a day for the last fifty years. Well of course it is good wine he gets because he is wealthy? 'Yes, none of your adulterated stuff.' Well he is a fine looking man? Oh very, we have not finer in the town. What is your argument? That wine cannot be so bad a thing as you represent, when a man is so hale at eighty, after taking so much wine. And the rest of the doctors looked hard at me. "Now for your opinion," said the lawyer."

683. "Well, I cannot give an opinion without knowing the facts. The gentleman lives in a good situation? The best in the town, the only eminence in the district. He lives well and extravagantly." "Just so." what sort of a lady is his wife? "Oh, she is a very moderate woman." Pretty healthy? "Yes." Well, I should think then you have not much to do in this family? "O yes," said the doctor, but I have. Proceeding on this hint, I asked

what family they had. "O, they have had eleven." Indeed! How many have they now? "Six." That is very singular said I, for I suppose you believe in the law that like produces like. Is there any more certain principle in physiology than that good food makes good blood, good blood good structure, and good structure transmits good structure? When the parents are healthy, the children must be healthy. "I cannot deny that" said he.

684. "Now I replied, there is something to be accounted for—six children are living, five are dead. But what is the constitution of the six? "O, said he, for that matter, they are hippednervous." "O," says a lady over the table, "You know Miss was touched in the head." "And Mr. George" said another, was in the asylum, and Mr. William you know is certainly queer," says a third.

685. "Gentlemen, I said, without going any further, nothing is more certain than that some great and serious law of life must have been violated; and upon the face of it, that *one bottle of wine a day for fifty years may have been the agent*, that is my case." The sequel of the history: the old gentleman died of apolexy at eighty-three, and fifteen years later the last grandson had spent all his money but a pittance and had retired to the country town.

686. Though the effects of moderate tippling may not be so apparent as down right intemperance, yet "his sin will find him out," The effects upon the mind and body may not always show themselves on the drinker, yet, it is very doubtful if ever the progeny escape the effects in one form or another. The hereditary drink-craving is, without doubt, transmitted by those who were never actually drunk. The long continued and regular use of alcohol without extending as far as intoxication, is sufficient not only to transmit hereditary intemperance, but has a far greater tendency to do so than occasional or frequent drunkenness, with intervals of entire abstinence. This applies with greater force to mothers. We have met with not a few cases of the drink-craving which were traceable to the regular but moderate drinking of malt liquors by the mother during the period of nursing and before, under the erroneous impression that she needed them as a tonic to give her strength. These anti-natal victims of intem-

perance or the use of alcohol are all around us, and are, we believe on the increase, from the increased drinking of females in every walk in life.

687. These hereditary effects manifest themselves in intemperance, in insanity, or a tendency to take the form of some disease of the stomach, liver, lungs, bowels, kidneys, or other organs or tissues; for it is impossible that an agent so foreign to the animal economy can be used habitually without inflicting injury on its delicate tissues.

688. Thus alcohol inflicts physical deterioration on our people which is no less an evil than the impoverishment it inflicts on the individual. "And that civilized nation" says Dr. Richardson, "which shall first give up its indiscriminate use shall be first in its wisdom, its beauty, its happiness and its power."

689. The Citizens Association of Pa. in their report of 1868, said: "that two-thirds of the pauperism and one-third of the dependent classes, as insane, feeble-minded, etc., in Pennsylvania, were due to intemperance. By this estimate there are in the United States 8,175 idiots, and 12, 477 insane, caused by drink, which is below the true number.

690. The effects of strong drink on progeny make their use a three-fold question of vital importance, forcing itself alike on the attention of the Political Economist; the Social Reformer, and the Medical Profession.

691. The main facts in relation to the effects of intoxicating drinks on progeny, lie too deep down in the secret recesses of domestic life to enable us to catch but a mere glimpse of their terrible results.

692. And though we may be able to trace the effects of the down right intemperance of the parents, to the drunken, insane and idiotic inheritance of the children. Yet we are unable at all times to trace the disorganizing and degenerating effects of the (so called) moderate use of alcohol upon the children to the third and fourth generation. For let it be remembered that its hereditary physical effects may neither show themselves nor end with the second generation; but may be exhibited in the third and fourth most unmistakably. Hence, whatever may be

What is the testimony of the Citizen Association? (689). What may be deduced from the foregoing? (690-691-692).

the effects traceable to the use of alcohol, the great bulk of the evil results will remain unknown but not unfelt. In the words of Dr. Richardson, "Amongst the many inscrutable designs of nature, none is more manifest than this, that physical vice, like physical features and physical virtue descends in line. It is, I say, a solemn reflection for every man and woman, that whatever we do to ourselves so as to modify our own physical conformation and mental type for good or for evil, is transmitted to generations that have yet to be. Not one of the transmitted wrongs, physical or mental, is more certainly to pass on to those yet unborn, than the wrongs which are inflicted by alcohol." By the census report of 1870, there was in the United States, 20,320 blind; 16,205 deaf mutes; 37,432 insane; and 24,527 idiotic, or a total of 98,484. At the lowest estimate, one-third of these classes of dependents are the results of the use of alcohol, or 32,832 in this country in 1870, which cost annually not less than $6,566,400. To this direct cost must be added the loss of labor which if we allow $200 a year above their support, will be an annual loss of $13,132,800. What an immense expense to pay for a crop of dependents made such by alcohol—either before or since their birth.

LESSON FORTIETH.

INTEMPERANCE A DISEASE.

693. From the morbid effects produced by alcohol upon the stomach, the blood, brain and other tissues, it appears reasonable that intemperance may become a disease. Every one can understand that, when a man has *delirium tremens*, he is diseased, but it seems to require more medical experience to discover that *intemperance is a disease.*

What must we bear in mind? (692). What was the number of dependents, and their cost in 1870? (692). What is intemperance? (693).

694. That it is a disease of the brain, the insane actions of persons under the influence of alcohol most unmistakably demonstrate. Sheriff Barclay, of Perth, Scotland, gives a number of cases of the actions of persons when drunk, which could only result from some peculiar mental disease; and also shows that habitual drunkenness in certain individuals is not only attended with a tendency to commit crime, but that the crimes committed under such circumstances have a marked uniformity in character. One woman, during a period of twenty-one years, was committed to prison 137 times for being drunk and smashing windows. A man, who had been a soldier and had received a wound on the head, when drunk, he would steal, and the objects of his thefts were always bibles; he stole nothing but bibles, and was transported for the seventh act of bible stealing. Then another man stole nothing but spades; one woman stole nothing but shoes; and another stole nothing but shawls. A very curious case is that of a man of the name of Grubb, who was transported for the seventh act of stealing a *tub;* "there was nothing," says the Sheriff " in his line of life, and nothing in his prospects, no motive to make him especially desire *tubs;* but so it was, that when he stole, it was always, excepting on one occasion, a *tub.*" These, with every day's experience of the insane actions of habitual drunkards, clearly indicate that habitual drunkenness is one form of insanity, or at least so closely allied to insanity that the victim is a subject for physical and mental treatment in some hospital, or reformatory, so that by the absence of the temptation of drinks, he may be able to regain self-control, and finally overcome the power of his appetite.

695. Intemperance is as much a disease as a sin, and is caused or induced by daily drinking. It is generally at first a very moderate quantity of some mild, fermented drink, and chiefly in the form of beer or light wine. Yes, even home-made wine, pressed to the lips, perhaps of a beloved child by a fond mother. Its effects will be the same, however ignorant she may be of the evil inflicted on her darling.

Give facts and arguments? (694). What is the cause? (695).

696. The habit or disease once established in the constitution like any other disease, operates independent of the *will* of the victim. And though he may refuse to gratify his appetite, yet he is not able to control the craving or the cause that *gives* rise to it.

697. When the medical profession clearly comprehend that intemperance *is* a disease, doctors will pause before prescribing so dangerous an article as alcohol, even as a medicine, unless with the same care as other poisons. A simple glass of beer at dinner prescribed to tone up and strengthen the patient, has often ended in the production of physical cravings, that have led to the physical, mental, and moral wreck of the person. There are but few physicians to-day, worthy of that name, who believe in the strengthening and tonic power of alcohol; and fewer still, if any, but can furnish some cases of injury from the indiscriminate use of alcoholic drinks.

698. It is in vain to ask a man to exercise self-control while you administer to him an agent, whose physiological and psychological effects deprive him of the power to exercise that virtue. All arguments in favor of the moderate or judicious use (so called) of alcoholic drinks, and that they are harmless when so used, are as injurious as they are false to science, reason and experience. Few persons are aware of the danger connected with the daily or occasional use of alcoholic beverages which poison the brain, and subvert the intellectual powers.

699. There is only one remedy for intemperance. Total abstinence is the only cure for this terrible disease. This simple remedy has proved effectual in tens of thousands of cases. Yet, many from hereditary predisposition derived from drinking parents or ancestors, or the derangement of their systems by the use of alcohol, are so infirm of purpose, in other words so much diseased, that they have not *will-power* to abstain from the drink if it can be obtained. There is no nobler or grand heroism than that which overcomes the hereditary *drink-craving*.

700. The man or woman so afflicted has not only to contend against the temptation of the drinking customs and practices of his associates, the numerous drink-shops

What is said of the medical profession? (697). What's in vain, and what arguments are false? (698). What is the remedy? What are the difficulties? (700).

at every step, on every hand, with their allurements, but has to wrestle against flesh and blood; to fight against himself; to change almost his entire being and his appetite. It is not therefore a wonder that so many have failed to conquer this demon, alcohol, and have fallen by the way. The only safety for such is total-abstinence forever. All alcoholics are their mortal foes. They must avoid them all. They must refuse every kind, fermented or distilled, upon all occasions, and under every circumstance, even as a medicine or as a religious ordinance, for such to drink, is to die. The victim of the hereditary crave for alcohol, may be able to abstain, or to drink to excess, but he cannot drink in (so called) moderation. At the first drink his whole organisms is set on fire, or as a caged lion let loose, which no one has power to subdue or to slay. That these cases are not myths of the brains of fanatical total abstainers, no class of men know better than the doctors, who move among all classes of society. They also know that they are not confined to the lower order of society, but are found among all ranks and classes, and are ever increasing, never diminishing; that a skeleton of this class is locked up in the cupboard of almost every household. For this the only remedy is total abstinence and prohibition of the drink-traffic.

LESSON FORTY-FIRST.

ALCOHOL: ITS EFFECTS ON CHARACTER, ETC.

701. The deterorating effects of alcoholic drinks on the individual can be seen almost everywhere. A certain amount of skill is essential to success in every occupation, and many are gifted above others with a natural aptitude for particular trades and professions. While this is true as a rule, yet, it is very evident that industry and perseverance in acquiring skill by the greater number of persons, takes the place of genius.

702. Alcoholic drinks so deaden ambition, destroy industry, and habits of attention to business, that they often

What is necessary for success in life? (701). What effect has alcohol on ambition, etc.? (702).

disqualify the users physically and mentally to provide for themselves and families. Many business and professional men, who might have earned distinction, and contributed to the general welfare of the community, have by indulgence in strong drink, lost their standing in society; ruined their prospects; destroyed their characters, and have sank into the lowest depthof misery, want, and moral depravity.

703. Then again, while the use of strong drinks creates the necessity for additional expenses, it lessens the power to obtain the means to defray them. With this wasting of their resources comes the loss of social position, influence and usefulness.

704. Everywhere we find persons who for drink, have not only squandered fortunes, but missed many golden opportunities and chances for making and accumulating vast wealth, who are now moral and financial bankrupts. Doctors, lawyers and even ministers might be named, who by intemperance have fallen from high social standing, and are now physical, mental and moral wrecks, herding with our pauper, vicious and criminal population.

705. The tendencies of intoxicating drinks, are directly to produce gross vice and sensuality, to excite the lowest human passions and intensify every vile affection. Professor Otto, of Sweden, who made special investigations and experiments on this subject, said: "The greater part of the exciting influence of alcohol is directed toward the posterior and inferior portions of the brain; in other words, it excites chiefly the organs of the animal propensities, and according to the law, that whatever stimulates strongly one class of cerebral organs, weakens another class. Thus while alcohol adds vigor to the propensities, it enfeebles the intellectual faculties and the moral sentiments."

706. There are few habitual drinkers who do not in the freedom of social converse, betray by their language, that their minds are low and groveing, whom we would not consider fit companions for innocent and virtuous youth. The custom of ladies leaving the room when alcoholic drinks are introduced, sufficiently attest their

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What are other effects of alcohol? (703). What do we find everywhere? (704). What are the tendencies of intoxicating drinks? (705-706).

polluting influence. Sober and pure-mined men and women cannot remain long in the society of persons under the influence of alcohol, without their cheeks being mantled by the blush of shame; for even lips esteemed pure, when set free by strong drink, will use language of which they would be ashamed in their sober moments.

707. Religious and moral principles, the essential element of personal worth, are all blasted or destroyed by intemperance; and alcohol prevents the establishment of christian principles in the human mind. No man can be devout and intemperate; nor can a devout man habitually use alcoholic drinks to any great extent and retain his piety.

708. Alcohol not only prevents the growth of religious principles, and the formation of a religious character, but destroys both religion and morality; and no ruin is so complete and shocking as that produced by alcohol, for the drunkard is not only cast out by society, in this life, but shuts himself out of heaven in the life to come.

709. Nor can we wonder that the ruin of alcohol is so complete and terrible, for the wasted means, lost health, bloated countenance, livid lips, rags, penuary and wretchedness, are but the outward manifestations of the desolation and ruin within. "Every inordinate cup is unblessed and the ingredient is a devil."

ALCOHOL: ITS EFFECTS ON HOME LIFE, ETC.

710. Another direful aspect of strong drink is its results upon Home Life. Here it assaults the fountain head of our social and national character, and the scenes of our greatest, earthly joys. Affection may build up a home, spread around it the lovliest forms the human eye can rest upon, or refinement and taste desire; fill every apartment with all that can make home desirable; if intemperance enters, it destroys the happiness of all within its threshold, and banishes every hope and joy.

711. Vast numbers of our people appear almost destitute of the comfort and happiness of home, around which should cluster the happiest and the most joyous associa-

What are their effects on religious principles; (707-708). What do the external signs of the use of alcohol indicate? (709). What effects has alcohol on homelife? (710). What is said of the destitution and homes of children? (711).

tions of childhood, and the most hallowed recollections of youth. In numerous cases their homes are entirely the reverse of this; intemperance has filled them with poverty and misery. Of all abodes, the drunkard's home is the most deplorable. It is not only associated with cold, hunger, rags, tears and woe, but frequently with crime, physical and mental disease, and death under its most appalling circumstances. Children in such homes, find little to love, to cherish or to recall with pleasing recollections. Thousands of such homes exist in our large cities. These homes are the training schools of vagrancy, vice and crime, for which society has to provide and support,

712. In most of our cities there are whole streets, and even neighborhoods, where almost every house is a drunkard's home. Indeed, in many of these dwellings, every apartment from the cellar to the garret is the abode of one or more drunkards, where wretchedness, and moral and social depravity are seen in their most gross and frightful forms.

713. The most degrading effects of drink, can be seen at all times, day or night, on Sixth and Seventh Streets near Lombard and South Streets, Philadelphia, in the persons of numerous debased men and women, white and colored, who flock from the adjacent courts and alleys, and congregate around, and within the drink-shops of that region; or obstruct the sidewalks with their disgusting forms, and shock the ears of the passers-by with vile and profane talk. So abandoned are most of these miserable victims of drink, that the jails, houses of correction, and almshouses are looked upon as so many snug retreats, to which they can retire during the Winter, and be warm and well fed, and come out in the Spring in good condition for their Summer and Fall debauch.

714. As wretched as the out-door life of this class may be, their homelife is much worse. On June 2d, 1873, his Honor Mayor Stokley, visited this neighborhood, and saw some of the horrors of low-life, within a few squares of his office, and notwithstanding the wretched condition in which the Mayor found the residents of this region, he

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What do we find in large cities? (712). What is said of certain classes in Philadelphia?(713). When did Mayor Stokley visit Alaska Street, etc.? (714).

was assured by Sargeant Duffy and Rev. John Long, who accompanied him, that the neighborhood was much improved since he (the Mayor), had cleared it of some of the worst characters who formerly infested it.

715. In one tumbled down house in alaska Street, of five or six rooms and a cellar, each of which was rented to a different tenant, who in turn took boarders. In one room eight by ten feet, six persons white and colored, males and females slept together on the floor. In the cellar, a miserable, bloated white woman with an eye discolored by blows from her husband, was picking rags. They are heated with stoves, in some the stove-pipes were stuck out of the window. One room five feet by seven, with one small window in the back, was occupied by two women besides their nightly lodgers.

716. Even at the time of the visit (midday) when the lodgers are away, the houses are swarmed with men, women and children, and many occupants of the rooms were already insensible or nearly so from the effects of liquor. The furniture of the houses were a rickety chair or bench, and a bundle of straw for a bed; the larder consisting of an old soap or starch box, containing scraps of meat and bread heaped up together; while the occupants were clothed in rags, many of them huddled together on the floor, drunk and shameless. In one room was a young girl with two other persons, she was lying on a heap of rags, with scarcely enough clothing to cover her. She came from Delaware a day or two before well dressed, and in less than twenty-four hours her clothing had disappeared and she was drunk and in rags.

717. In another room in this house, there was a young white woman, who left her husband in New Jersey, and is now living with a colored man in squalor, filth and idleness. In the room above this, was a fine looking, intelligent white woman well dressed, and to all appearance respectable, who was keeping house for a colored woman who lived in a room about eight feet square. The white woman said her husband is a pilot on a steam-tug, that she has left him and receives ten dollars a week for her support, of which she gives three dollars a week for her board in Alaska Street.

Describe what he saw? (715-716-717-718).

718. In another room of this house a man and his wife laid drunk, one on the floor and the other on a settee. In another room a couple were lying drunk on the floor. In a house on the opposite side of the street, a room was found, in which a charcoal fire was burning, the ceiling being blackened and charred with smoke; the occupants were two women and a young girl, who escaped asphyxia by lying drunk on the floor, while the fumes from the charcoal escaped through the open window.

719. "Some of the taverns in the neighborhood were visited by the Mayor. They had all been licensed to sell liquor, and did a flourishing business. In one, six or seven miserable drunkards, two or three with wooden legs, all pensioners on the Government, were huddled together. They had been in the tavern several days, and will to-day (June 3d), draw their pension, when the money will be turned over to the tavern-keeper; and these miserable recipients of the government bounty will return to their homes penniless and wasted by drink, only to be repeated when the next pension day approaches."

720. These are a few of the sights witnessed by His Honor Mayor Stokley, on June 2d, 1873, at midday, and published in the daily papers the next day. Such is the *home-life* of some of the people in the City of Brotherly-Love. Such sights are a disgrace to a christian city, and should bring the blush of shame to the cheeks of any of our Legislators who would favor any law to license the sale of drink that produce any or all of these sad and terrible conditions.

721. True they are but a few of the worst results, but it must be remembered that there are thousands of homes in our country little, if any better, and thousands more are fast descending to a like, if not a worse state; that it is only a matter of time, when they will arrive at this condition, be it long, or short.

722. When strong drink enters the household, the children are usually the greater sufferers. Their food is lessened and coarser; their clothing more ragged, and their intellectual, moral, and religious culture neglected. Drunkards are not able to feed and cloth their own wives

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What is said of the taverns and pensioners? (719). What is remarked of license, etc.? (720). What are the effects of drink? (721-722).

and children. They cannot afford such expensive luxuries as food and clothing for their own families. Should the father and mother both be drunkards as is often the case, the children must obtain their food and clothing as best they can, which is frequently by begging, or stealing, or both.

723. Husbands and fathers for drink, will not only neglect their wives and children, but inflict upon them the most revolting cruelties; which are both frequent and numerous, judging by the cases published in the newspapers and official reports, for scarcely a day passes, that does not bring to light some case of neglect and cruelty by drunken parents

724. The results of drink on home life are the same everywhere. In most of the large cities in England, Scotland and Ireland, there are whole streets in which the condition of the inhabitants are similar to those described in Alaska Street, Philadelphia, or worse. In Glasgow, Scotland, a few years ago, of 82,000 homes, 28,000, or over thirty-three per cent. consisted of a single room; many of them atties without a fire-place, and damp underground cellars. In Liverpool there were more than 6,000 such cellars, the abodes of drunkenness, squalor, poverty, rags and misery. In that city alone, there were from twenty-five to thirty thousand neglected, ragged, and almost homeless children.

725. From recent reports, two and a half million children in the United Kingdom of Great Britain, are growing up entirely uneducated, the great majority of whom are exposed to the evil influence of drink and its attendant vices. Dr. Guthrie affirmed that ninety-nine per cent. of the children admitted into his ragged schools, were the offspring of dissipated parents.

726. How great is the responsibility of those who introduce alcohol into the home; or allow the sale of this agent as a beverage, which mars home life, destroys the family circle, and drags helpless, innocent victims to infamy, degradation and ruin. "Woe unto that man by whom the offence cometh." "Woe unto him that giveth his neighbor drink, and maketh him drunken also."

What effects on children? (722-723). What of England, Scotland, etc.? (724) What of neglected children? (725). What is said of responsibility? (726).

CHAPTER XI.

ALCOHOL: ITS RELATION TO PAUPERISM, CRIME, ETC.

LESSON FORTY-SECOND.

ALCOHOL: ITS RELATION TO PAUPERISM, ETC.

727. Intemperance, poverty and pauperism are as closely united as cause and effect. There is a never failing connection between the facilities for obtaining intoxicating drinks and vagrancy and pauperism. Money uselessly squandered for drink; time lost in drinking; wages not earned when they ought, and might be earned, are the sure means of producing poverty and pauperism. Every cent spent for drink is taken directly from the means of procuring food, clothing, and other necessaries of life. When we consider the immense sums spent for liquors, we cannot wonder that so much pauperism exists: that the families of our working classes are so often in want of the simplest necessaries, and that their homes present scenes of discomfort and unhappiness.

728. The Board of Public Charities of Pennsylvania, in 1872, said: "The most prolific source of disease, poverty and crime, is intemperance. In our hospitals, as well as in our almshouses and prisons, a large proportion of the inmates have reached the refuge in which they are found by the way of habitual intoxication. We have spoken of intemperance as a fruitful source of pauperism and crime; it is doubtless the proximate cause of nine-tenths of the idleness, brutality and vice which afflict society. Government ought wisely to restrain, never to encourage, this prolific evil. Intemperance, with its retinue of infirmities, is, to a large extent, an inherited

What is the relation of alcohol to pauperism? (727-728).

vice; that is to say, the children of the slaves of idleness and appetite, are predisposed to follow the ways of their fathers; partly by constitutional proclivity; partly by the influence of example, and partly by direct and criminal instruction, under which their lips become familiarized with the intoxicating cup, and their hands with pilfering and other iniquity."

729. These views of the Board of Public Charities of our State, agree substantially with the declaration of the Citizens Association of Pennsylvania, charted by the Legislature to report on our dependent and criminal population. In their report to the Legislature, February, 1868, they said: "It will not be doubted that two-thirds of the pauperism and crime are justly attributed to intemperance; and it is stated by authorities that one-third of the dependent classes, as insane, feeble-minded, etc., are to be traced to the same cause." In that year 14,988 were in poorhouses, or one in 246 of the population, whose cost of maintenance was $1,597,720, or $2.67 for each voter in the State. The out-door relief cost $190,376.56, or 32 cents for each voter. In addition there were about 361,000 vagrants, who were furnished with meals, at an estimated expense of $54,150, or nine cents to each voter. There was also 119,000, nights' lodgings furnished to traveling poor, which added to the 46,250 nights' lodgings furnished to vagrants in the station-houses of Philadelphia, gives a a total of 165,346 nights' lodgings. Three-fourths of this vagrancy is directly traceable as the result of strong drink.

730. In the same year, (1867) 8,447 were in county jails, and 6,699 in penitentiaries, or one for 402 of the population; the cost of maintaining these prisoners was $1,464,029.60, an average of $2.45 for each voter in the State.

731. By the rule of the Citizens' Association, the aggregate cost of maintaining the paupers and criminals, due to strong drinks, is $2,204,244 per year; the cost of the insane, idiots and other dependents, due to the same cause, $55,666.66, or a total cost of $2,250,010.66, annually, caused by drink.

732. In 1872, 20,203 dependents were supported in our State, at a cost of $1,148,296.60. In addition to these,

What said the Citizens' Association of Pa.? (730-731). What is said of pauperism in Pennsylvania? (732-733-734-735-736).

more than sixty thousand vagrants were relieved, of whom four-fifths, or more, owe their condition to strong drink.

733. In 1874, September 30, there were in the fifty-eight alms-houses of the State, 7,782 inmates; an increase over the previous year of 1,379, or 21.52 per cent. Of this number 6,332, or 81.37 per cent., were sane; 1,226, or 15.76 per cent. insane; 43, or 0.55 per cent., idiotic; 131, or 1.68 per cent., blind; and 50, or 0.64 per cent., were deaf mutes. The estimated number of insane and idiotic in the State, September 30, 1874, was 6,956; 4,508 insane, and 2,445 idiots; one-third of which, as already seen, is estimated to be due to intemperance.

734. The number of vagrants in 1875 was 148,390; of these, 138,425 were relieved in alms-houses, and 9,965 by out-door relief. Of these vagrants ninety-five per cent. received one night's lodgings, or 140,888 lodgings; an increase of 45,998, or 48.49 per cent. over 1874.

735. The number of vagrants, or tramps, supplied with meals, in 1875:* in alms-houses, 284,678; out of alms-houses, 11,466; or a total of 296,144.

736. *Table of Dependents in Pennsylvania in* 1875, *with the Increase over the Previous Year and Expenditure for the Several Classes of Dependents.*

Classes of Dependents	*Sept.* 30, 1875.	*Increase over* 1874.	*Per Cent. of Increase*	*Appropriated by State.*	Total Expenditure.
Insane and Idiotic..	4,567	139	3.14	$22,691.60	$806,811.56
Deaf and Dumb.....	374	96	34.53	26,748.50	186,626.93
Blind.....	402	42	11.67	39,000.00	83,310.40
Paupers, etc.....	25,399	7,367	33.07		1,578,714.65
Aggreg'te Depnd'ts	30,742	7,644	33.07	$88,440.10	$2,655,463.54

By the rule of the Citizens' Association, the cost of insane, idiotic, deaf mutes, blind and paupers, directly the result of drink in Pennsylvania in 1875, was not less than $1,411,379.21.

737. If the working-classes did not spend their money in good times for drink, in seasons of commercial depression not one in ten would have need to go for aid to our public charities. Tens of thousands, by unwisely spending their money for drink, place themselves in a condition

What is said of the working classes and vagrancy? (737-738).

* Report of Board of Public Charities for 1875.

that in case of bad trade or sickness, they and their families must greatly suffer, or become burdens on our public charities. Could we ascertain the family and individual history of the inmates of our alms-houses it would be found that nine out of ten were brought to that condition, directly or indirectly, by drink. Every drink-shop is a moral plague-spot and hotbed of disease and destitution.

738. The fearful results of strong drink are not only manifested by the returns of inmates in our pauper institutions, but by the mendicity and beggary everywhere existing. As already seen, the vagrants and traveling poor relieved in 1875, in Pennsylvania alone, were 148,390, an increase over 1874, of 49,392, or 48.41 per cent. The greater part of this vagrancy is created and perpetuated by strong drink. The expense to our people by beggary and vagrancy is little less, if any, than the pauperism of our public institutions. Vagrants have become a most dangerous class to society, whose demands many persons fear to refuse, least they should seek revenge by privately injuring them in person or property.

IN NEW YORK, THE NUMBER OF POOR

739. Aided during the six years between (1868–1875), was 1,064,505, of whom 718,473 received out-door aid, and 346,032 were supported in alms-houses. The entire expenditure for these six years was nearly fifteen million dollars ($14,786,091.39), of which nearly ten million dollars ($9,946,934), was consumed in alms-houses, and nearly five million ($4,839,150.62) in out-door relief. The average yearly expenditure for both kinds of relief was nearly two and a half million ($2,464,348.56). This annual cost of pauperism does not include the interest on capital invested in buildings ($448,848.82), which, if added to the cost of support, is an annual expenditure for pauperism of nearly three million dollars ($2,913,197.38). Two-thirds of this cost, at least, or nearly two million, ($1,942,131.58) is the result of the use of intoxicating drinks.

740. By the Tenth Annual Report of the State Board of Charities (1877), there were 12,614 in the alms-houses of the State—6,384 men, and 6,230 women. Of the men,

What is said of pauperism? (739). What said Mr. Brennan? (740).

84.36 per cent. were intemperate. Of the whole number of paupers sixty-two per cent. were of foreign birth.

While on a visit to the institutions on Blackwell's Island, with the members of the Right Worthy Grand Lodge of I. O. of G. T., by the kind invitation of the Commissioners of Charities and Correction, of the city of New York, May 29, 1880, Commissioner Brennan informed us that the inmates of the workhouse number annually from 14,000 to 15,000, who are sent there for drunkenness and for conduct under the influence of drink.

741. From the report of 1878, we find that in that year 15,232 were sent to the workhouse, of whom 6,520 were males, and 8,712 females, or more than eight females to six males; thus showing the degrading and ruinous effects of alcoholic drinks, especially upon females. No one can visit those institutions without being impressed with the terrible results flowing from the drink, and the necessity for more energetic and persistent labor to destroy the liquor traffic, and save our fellow-men from its evils.

742. The pauperism in Pennsylvania and New York produced by alcohol is not proportionately greater than in other States of the Union. Eight-tenths of the pauperism in the United States result directly from the same cause. Not less than 77,401 of the paupers in the United States, in 1870, were directly due to strong drink, at a direct cost of not less than $7,286,952. Nor is this the whole of the evil, for the loss of the labor to the country will greatly exceed the cost of their support. The direct cost and loss from the pauperism in the United States is not less than $15,000,000 annually. No one who knows anything of the subject, and reflects a single minute, will conceive this estimate to be an exaggeration. If the facts could all be ascertained we feel satisfied that it would be twice $15,000,000. What a terrible price to pay for this wretchedness! Surely we "pay too much for our whistle."

What is said of the report of 1878, N. Y.? (741). Give number as cost of dependets in the United States? (742).

LESSON FORTY-THIRD.

ALCOHOL: ITS RELATION TO CRIME, ETC.

743. The close and intimate relation between alcoholic drinks and crime has long been observed, and is a subject deserving the most serious consideration. Everywhere the use of these drinks has been productive of crime; indeed the reports of officials, and the testimonies of police magistrates, judges, etc., most clearly show that alcoholic beverages are the source of three-fourths of all the crimes committed in every community.

744. There can be no question but that drunkenness and even the regular use of these drinks, in a certain degree, tend to lower the moral tone of both sexes, as their influence seems to excite unduly the passions and animal instincts, while they blunt the intellectual and moral functions. (See p. 705.) The inebriate is certainly ruled by the cravings of his lower instincts and passions, hence crimes against persons are chiefly and directly due to alcohol, and as already stated (L. 40), there are many crimes committed by persons under the influence of drink, which show a singularity indicative of a peculiar kind of insanity. Crimes are committed under the influence of drink from which the perpetrators would shrink with horror in their sober moments.

745. The chief amount of crime is committed, not by persons in a positive state of deep intoxication, but while only just sufficiently under the influence of alcohol as to lose control of the lower passions, or in that condition when men are easily tempted to do evil and readily provoked to acts of violence.

746. The majority of criminals have charged the drink as the cause of their ruin. Others, again, about to commit some heinous crime, to give them courage, drown the conscience ,or to stifle every feeling of humanity, fly to alcohol, to prepare them for the deed. It is said the *President*

What intimate relation exists, and what are the reports, etc.? (743) What are the effects of alcoholics, etc.? (744). What is said of inebriates and crime? (744). Under what conditions is crime committed? (745). What is said of Wilkes Booth? (746).

murderer, J. Wilkes Booth, before he could nerve himself for the bloody and treasonable act of striking at the loyal heart of our nation, by cruelly assassinating the beloved Lincoln, had to fortify himself with brandy for that heartless, cruel deed! Oh, alcohol! what a loss! what a sorrow does our *nation owe to thee in this one bloody act alone!*

747. Intoxicating drinks in the hands of those desiring to lead others to vice or crime are potent instruments. Tens of thousands have been unsuspectingly led from the level path of virtue down the rugged hill of vice and crime by the demoniac agency of strong drink. In every portion of Christendom these terrible results of the use of strong drinks, and the traffic in them, are seen.

THE NEW YORK PRISON ASSOCIATION.

748. In the Twentieth Annual Report said: "There can be no doubt that of all the proximate sources of crime, the use of intoxicating liquors is the most prolific and the most deadly. * * Not less than sixty thousand to seventy thousand human beings, men, women and children, either guilty, or arrested on suspicion of being guilty of crime, pass every year through these institutions. The judgment of these jail officers varied from two-thirds, as the lowest estimate, to nine-tenths, as the highest, and on reducing the several proportions to an average, seven-eigths was the appalling result obtained," as caused by drink.

749. Governor Dix, in his message to the New York Legislature, in 1873, said: "The alarming increase in the frequency of the crime of murder in the city and its environs, demands your most serious considerations. Scarcely a day passes without witnessing a brutal, and in many instances, a fatal assault upon the persons of unoffending individuals, usually in drinking saloons."

750. In the same year the Mayor of the city of Baltimore stated, that of ten thousand arrests, during the past year, eight thousand were directly or indirectly ascribed to the use of alcoholic drinks.

What is said of intoxicating drinks? (747). What is the report of the New York Prison Association? (748). What said Governor Dix, and the Mayor of Baltimore? (749-750).

751. Hon. William J. Mullen, Prison Agent of Philadelphia, in a paper to the National Prison Congress, Baltimore, 1872, stated that of the half million persons who had been committed to the county prison of Philadelphia within the last twenty years, there had been about five hundred for murder, seven hundred for attempts to murder, over forty thousand for assault and battery, and over two hundred thousand for drunkenness. In nearly ever case of murder or attempt to murder the parties were intoxicated.

752. Rowland Burr, Esq., a magistrate of Toronto, stated to the Canadian Parliament, "that nine-tenths of the male prisoners, and nineteen-twentieths of the females, are sent to jail by intoxicating drinks. Of twenty-five thousand sent to the Canada jails in four years, twenty-two-thousand owed their imprisonment to drinking habits."

CRIME IN PENNSYLVANIA IN 1874–5.

753. The following exhibits the criminal classes in penitentiaries, county jails, work-houses, and houses of correction, either as convicts, summarily convicted by justices of the peace, etc., or otherwise in prison for payment of fine and costs, by court, or awaiting trial at the above dates:

	Convicts.							
	Penitentiaries.	*County Prison.*	*Work House.*	*Total Convicts.*	*Summarily Convicted.*	*For Payment of Fine or Costs of Court*	*Awaiting Trial.*	*Aggregate in Prison.*
September 30, 1874..	1063	877	143	2083	1190	67	449	3789
" 30, 1875..	1264	934	177	2375	1670	42	579	4666
Inc. Sept. 30, 1875....	201	57	34	292	480	25	130	877
Per cent. Increase.....	18.9	6.5	23.8	14.0	40.3	37.3	28.0	23.1

754. By the above, on September 30, 1875, there were 2,375 convicts in penitentiaries, jails and work-houses,

What said Wm. J. Mullen? (751). What said Rowland Burr? (752). What of criminal classes in Pennsylvania? (753-754).

being an increase of 292, or fourteen per cent. over previous year. In addition, there were 1,670 persons summarily convicted by magistrates or justices of the peace for disorderly conduct, breaches of peace, etc., being an increase of 480, or 4.3 per cent. The aggregate of all classes of prisoners was 4,666, an increase of 877, or 23.1 per cent. over previous year, chiefly due to intoxicating drinks. In the House of Correction, in Philadelphia, there was an increase of 684, or 115.3 per cent. More than eighty per cent. of the inmates, from official reports, are directly brought there by drink; and from the general character of the inmates, the remaining twenty per cent., we may safely say, were brought to that condition, indirectly, by the same cause.

755. In 1876, there was spent in Pennsylvania:

For criminals	$1,324,604
For dependents	1,942,916
For criminals and dependents . . .	$3,267,520

Of this sum, more than two million dollars are directly the result of drink, and the licensed drink traffic; for every drink-shop is a moral plague-spot and hot-bed of destitution, vice and crime.

ARRESTS AND DRINK IN PHILADELPHIA.

756. About eight-tenths of all minor offences brought before the Philadelphia courts are the direct result of drink. The arrests by the police of Philadelphia, with the offences caused by drink, in 1872-3-4-5-6, were as follows:

	1872.	1873.	1874.	1875.	1876.	Total 5 years.
Total Arrests	40,007	30,400	32,144	34,978	44,919	182,448
Assaults and Batteries	2,358	2,006	1,610	1,624	2,176	9,764
Assaults, with Intent to Kill	205	139	127	164	245	884
Breaches of Peace	4,661	4,039	4,250	4,394	6,427	23,771
Intoxication	15,782	10,077	10,295	12,502	19,053	67,709
Intoxication and Disorderly Conduct	9,769	7,897	9,661	8,245	7,668	43,240
Total, Directly and Indirectly caused by Drink	32,775	24,149	25,943	26,929	35,560	145,365

What of the cost of criminals? (755). What of arrests, etc., in Philadelphia, (756).

The number of arrests by the police of Philadelphia during the five years ending 1876, 182,448, or an average of 36,489 per year. The cases of assaults and batteries, assaults with intent to kill, breaches of the peace, intoxication, intoxication with disorderly conduct, all of which are directly or indirectly caused by drink, were 145,365; or an average of 29,189 a year. Of cases of drunk, and drunk and disorderly, there were 110,949; or an average of 22,189 per year. The cases directly or indirectly caused by drink were 79.65 per cent. of the whole arrests, or a fraction less than four-fifths. Of twenty-three murders committed in 1872, twenty were directly or indirectly caused by drink. The expenses of the police alone in 1872, were $1,246,713.98, two-thirds of which would not have been needed but for the drink.

757. It is as difficult to obtain the true amount of crime, and cost of conviction, and the support of criminals in the United States, as of pauperism. In 1873, by the Report of the National Prison Congress, of 1874, there were twenty Houses of Correction in the United States, besides the one in Philadelphia, from which no report had been received. The inmates received into these institutions, in 1873, were 29,183, the average being 3,884; nine-tenths of whom, in the opinion of the Wardens, were there by drink. The expenses of these institutions that year, exclusive of Philadelphia, were $1,037,241.

758. There were thirty-four Reformatories in twenty-six States. The average number of inmates, 8,924: 7,443 boys, and 1,481 girls; thirty-four per cent. of whose parents were intemperate, and thirteen per cent. had used liquors themselves. The cost of these Reformatories, in 1873, was $1,828,365. There were forty-four State Prisons, in 1873, with a total average of 18,520 inmates. The annual cost of these institutions that year was $3,045,789.

759. Thus there were in 1873, in Houses of Correction, Reformatories, and States Prisons, 56,627 inmates, costing the tax-payers, $5,911,395, of whom four-fifths are due to the use of strong drinks, or 44,300 inmates, at a cost of 4,729,116.

What is said of the various prisons and criminals in the the United States? (757-758). What of the cost of criminals? (759-760).

760. Nor are these the only burdens upon the industry of the nation, for besides the cost of prisons and the maintaining of prisoners, there are the police expenses, the cost of courts, and other expenses arising from the offences of which they were found guilty, which cost the country more annually than the expenses of maintaining prisons, and supporting criminals.

CHAPTER XII.

ALCOHOL: COST AND LOSS BY IT.

LESSON FORTY-FOURTH.

THE QUANTITY AND COST OF INTOXICATING DRINKS, ETC.

761. Having seen some of the evils resulting from the use of alcoholic drinks, let us endeavor to take a glimpse at the cost of the drinks and to consider whether it pays either to use them, or for the State to legalize their sale, and by so doing encourage their use.

762. By the careful examination of official reports, etc., we find that the quantity and cost of intoxicating drinks consumed in the United States during the last ten years were not less than the following:

1870	262,530,107	gallons,	costing	$619,425,110
1871	302,409,593	"	"	680,036,042
1872	337,288,060	"	"	735,720,048
1873	365,531,052	"	"	714,376,761
1874	359,446,249	"	"	674,431,167
1875	356,531,543	"	"	691,043,493
1876	361,307,418	"	"	615,685,616
1877	359,473,803	"	"	629,541,971
1878	359,906,813	"	"	565,837,501
1879	387,405,439	"	"	607,530,702
Total	$3,461,830,077	galls.	costing	$6,533,628,411

763 As seen by the above table there was consumed during the decade ending June 30, 1879, not less than 3,461,830,077 gallons of alcoholic drinks, costing $6,533,628,411, being an annual average cost of $653,362,841.

What was the quantity and cost of alcoholic liquors from 1870 to 1879? (762-763).

This is certainly below the direct annual cost for drinks, as this is only the cost of liquors on which the tax was paid. It is well known that immense quantities of liquors are consumed for which no revenue was paid. For the year ending June 30, 1879, there were seized 1,495 stills, and 3,281 persons were arrested for illicit distilling.

THE QUANTITY AND COST OF ALCOHOLIC DRINKS, AND THEIR COST CONTRASTED WITH USEFUL COMMODITIES, ETC.

764. The value of the exports and imports of the United States, and quantity and cost of liquors during the periods named, were as follows:

YEARS.	Value of all Exports from the United States.	Value of all Imports.	No. of galls. of Liquors.	Cost of the Liquors.
1801–25..	$1,624,350,449	$2,140,067,395	710,672,605	$1,954,349,665
1825–40....	1,438,007,501	1,701,006,889	426,403,500	1,172,606,790
1840–50....	1,120,215,845	1,105,613,828	711,200,890	1,001,479,250
1850–60....	2,321,487,128	2,683,136,860	1,160,826,250	2,343,269,520
1860–70....	3,163,953,876	2,376,055,356	2,034,760,570	6,688,536,300
Total.....	$9,668,014,599	$10,005,880,328	5,043,863,875	$13,160,341,525
1870–75...	3,097,004,753	2,995,215,766		4,115,032,177
Total...	$12,765,018,352	$13,000,096,094	.	$17,275,373,702

Total cost of drinks during the present century.....$19,693,969,936

The cost of intoxicating drinks from 1801 to 1870, was more than thirteen thousand million dollars, and during this century the nation's drink bill was nearly twenty thousand million ($19,693,969,936).

765. To comprehend the magnitude of these sums spent for drink, let us make a few simple comparisons. During the first twenty-five years of this century, alcoholic drinks cost nearly two thousand million dollars (or an average of seventy-eight million a year); only one hundred and eighty-six million less than all the imports, and three hundred and thirty million more than all the exports. During the succeeding fifteen years, from 1825 to 1840, the drink bill of the United States was more than one thousand million dollars; or nearly twenty-two million more than the value of all the exports; and in the ten

What was the cost of alcohol since 1800? (764). What comparisons are made? (765-786).

years from 1860–70, these drinks cost six thousand six hundred and eighty-eight million; forty-three hundred and twelve million dollars more than the value of all the imports; while in the five years of 1870-75, liquors cost more than four thousand million; or one thousand and eighteen million dollars more than the exports, and one thousand one hundred and nineteen million more than the value of the imports.

766. During the first seventy-years of the century, or from 1801–75, drinks cost more than seventeen thousand million dollars; or four thousand five hundred and ten million more than the value of the exports, and four thousand two hundred and seventy-five million more than the imports.

767. This hard-earned capital, that should have been spent for food and clothing, and to promote the happiness and prosperity of our people, was expended for strong drinks, which we have seen produce poverty, crime, misery, disease and death, besides burdening the industrious and sober citizens with taxes that would not have been needed were not these millions so spent. These sums spent for drink appear almost fabulous, yet they are verified by official reports.

768. By the census returns for 1870, the true value of real and personal property was little over thirty thousand million dollars ($30,068,518,507); the value of farms, nine thousand two hundred and sixty-two million ($9,262,803,861), and the value of farm production, betterments and additions of stock, two thousand four hundred and forty-seven million dollars ($2,447,588,658).

769. The value of all the products of our manufactures, in 1870, was four thousand two hundred and thirty-two million dollars ($4,232,325,442). The drink bill for the nation for the six years from 1870 to 1875, inclusive, was four thousand one hundred and fifteen million dollars ($4,115,932,621), or only about one hundred and fifteen million less than the value of our manufactures, while it is nearly twice the value of our farm productions.

770. Thus, our people in six years, spend in drink

What are the effects of drinks on sober citizens? (767). What is said of the census reports, etc.? 768). What of manufactures, etc.? (769). What is said of the destruction of property? (770-771).

the value of our annual manufactures, and in nine years they expend the value of nearly all the annual products of the industries of the whole country. Or, in other words, if on January 1, 1875, a fire had been kindled in the United States, and kept continually burning until the clock on Independence Hall had proclaimed the opening of the centennial year, and if during that year every article of our manufacturing industries, as soon as produced, had been cast into the flames, this destruction would not have inflicted as much injury on the pecuniary interests of the United States as was produced by the sale and use of intoxicating drinks during the preceding six years.

771. If products to the value of the money spent annually for drink were only destroyed by fire or flood, their destruction would not deprive the industrious classes of the physical and mental power to supply their place with others. But to spend money for alcoholic drinks, not only kills the goose that laid the golden egg, but also loses the egg. The money worse than thrown away for drinks, during the present century, was a little less than twenty thousand million dollars ($19,963,969,936).

772. If this immense sum of money was in silver dollars, at the rate of sixty per minute, working ten hours a day, it would take a person more than 1,521 years to count it. If each silver dollar weighs an ounce, the whole will weigh over 616,114 tons, and would require to haul them from the mint 1,232,228 carts, with a half ton each; and to place them in a line, allowing six yards for each, they would form a column over 4,200 miles long.

773. The total assessed value of all the real and personal property, in 1870, was fourteen thousand million dollars, and the true value thirty thousand million, while the cost of liquors from 1801 to 1880 was nearly twenty thousand million ($19,693,969,936), or two-thirds of the value of all the real and personal property of the United States, in that year. Thus, our people spent during the present century, two-thirds of the value of all the real and personal property that has accumulated since the landing of the Pilgrim Fathers on Plymouth rock, and all they brought with them. And since the Declaration of Inde-

What illustration of the money spent? 772). What is said of money spent since 1800, etc. (773).

pendence, it the real amount could be ascertained, it would be found that more money has been spent for alcoholic poisons than would buy to-day all the real and personal property in the country.

774. No people, however favored, can prosper, who waste so large a proportion of labor value on poisonous drinks. Money panics, hard times, and stagnation of trade must inevitably follow such waste. The people who practice such irrational political economy must sooner or later become bankrupt.

775. Money spent for drinks add nothing to the consumer's possessions, as do food, clothing, furniture, and other property, real or personal; the poisonous drinks, for which it is spent, give but momentary excitement to the animal passions, and sentient gratification, that leave the consumers physically, mentally, and morally worse for their use; so that it would have been vastly better for them if they had cast the money into the fire, or had poured the liquor into the sewer as soon as they had paid for it. There is not the least doubt, that if the money that has been expended in drink since the Declaration of Independence, had been devoted to the purchase of useful and necessary articles, the real and personal property of the country would be double the value of what it now is, and our people generally in a more happy and prosperous condition, as well as more intelligent, moral and religious; and the nation free from the taxation now imposed for the use of public charity and correction.

COST OF WAR AND DRINK CONTRASTED.

776. The whole cost of the war of the rebellion, North and South, from 1861 to 1866, is estimated by reliable *authority to be as follows; lives, one million; property, by destruction, etc., nine thousand million dollars. The United States expenditures, from June, 1861, to July, 1866, were more than five thousand seven hundred million dollars, ($5,792,257,000); of this, the actual war expensse were

What is said of the utility of money spent for drink? (775). What was the cost of the late war? (776-77).

*See "Our Wasted Resources." National Temperance Publication House, 58 Reade street, New York.

about five thousand three hundred million ($5,342,237,000). The expense of states, counties, cities and towns, in the North, not funded debt, is estimated at five thousand million.

777. The total expense to loyal States and National Government was more than six thousand million ($6,165,-237,000). The estimated direct expenses of the Confederate States, on account of war, two thousand million. The aggregate expenses, North and South, eight thousand million. The total receipts from all sources, during the second year of the war, were less than forty-two million; the expenditures sixty million per month, or seven hundred million a year. This immense cost of treasure and blood was not expended in vain, for the nation was saved, and chattel slavery abolished. But the slavery of strong drink still rules our country, and the immense cost of treassure and blood during the late war, sinks into insignificance compared with the loss of money and life resulting from the traffic in drink.

778. The loss in the rebellion occurred but once within a century, while the loss from the drink is continual. The loss of life from strong drink is almost incalculable; but it is not less in the United States than sixty thousand a year: and we may safely assert that every twenty years more human life is sacrificed on the altar of the drink traffic than during the five years of the civil war.

779. The cost of liquor from 1860 to 1875, inclusive, was more than ten thousand million ($10,805,558,477), or two thousand million dollars more than the aggregate expenses North and South during the war; and the cost of drink from July, 1866, to 1876, would more than pay the whole war expenditures of the United States, The war expenses averaged annually about seven hundred million, and it was said the nation would be bankrupt, and never be able to pay off the debt. Yet we may truly say, that in each year, during the war, as much money was spent for drink as for the actual war purposes. The conflict being ended, the people are still anxious about our great

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What of the loss of in the late war, etc ? (778). What of the cost of drinks compared with that of the war? (779).

National debt; yet the money spent for these drinks every three years would more than wipe it out forever.

780. Is it not shameful that a professedly Christian nation should expend six or seven hundred million dollars annually to produce crime, degradation, physical, mental, moral, and financial ruin? For these millions we have drunkenness, with its follies, its revels, its obscenity, its beastliness, poverty, ignorance and vice; accidents by land and sea; idiocy, insanity, the deterioration of our people, and governmental decay. These are the fruits and the cost of the drink-traffic. Does it pay?

LESSON FORTY-FIFTH.

LIQUOR TRAFFIC: ITS EFFECTS ON INDUSTRY.

781. The cost of liquors in the United States in the years 1870-1-2-3-4 and 5, was:

In 1870, .	$619,425,110;	In 1873, .	$714,376,317;
" 1871, .	680,036,042;	" 1874, .	674,431,167;
" 1872, .	735,720,048;	" 1875, .	691,043,493;

Total for six years, $4,115,032,177. The annual average for six years, $685,838,600.

782. It may therefore be safely estimated that our annual drink bill, in round numbers, is not less than $700,000,000. These six years drink bill is only about 116 million dollars less than the value ($4.232,325,442,) of all the products of our manufactures in 1870; and the annual average cost is only about 89 million less than all the wages paid for manufactures ($775,584,343) during the same period.

783. If the money annually spent for drink was expended for the following named products; it would purchase about one-half of what was manufactured of them in 1870:

For Food and Food Preparations,	$300,182,785
" Cotton Goods,	84,228,676
" Woolen Goods,	75,649,098
" Boots and Shoes,	90,822,045
" Furniture and House Fixtures,	37,769,859
Total	$588,652,463

What comment is made? (780). What is said of the cost of liquors from 1870-1875? (781). What comparison is made on this cost? (782). What would be the result if the money was spent for manufactures? (783-784).

784. The $300,182,785 if spent for food, etc., would cause a demand for 14,358 additional food preparing establishments, (as grist mills, bakeries, etc., etc.,) give employment to 48,436 persons, in these manufactories; pay $12,893,337 for wages; consume $241,231,471 worth of raw materials. Would give our farmers for grain alone, $181,157,263; or $131,056,975 more than the value of all the materials used in the manufacture of intoxicating drinks.*

785. To produce the cotton goods, woolen goods, boots and shoes, furniture and house fixtures, would require 20,712 additional establishments to manufacture them; employ 223,206 persons, pay for wages $78,249,052; and for raw materials, $165,134,304.

786. Thus, by spending $700,000,000 for food and food preparations, cotton goods, woolen goods, boots, shoes, furniture, and house fixtures; it would keep running 35,070 establishments; employ 271,642 persons; pay for wages, $91,142,380; cause a demand for $406,365,775 worth of raw materials, and leave a balance of $104,777,767 for profits and expenses upon the commodities until they reach the consumers.

787. It scarcely needs argument to show that spending money for intoxicating drinks diminish production. A traffic which obviously lessens productive labor, and wastes capital is essentially disasterous to the thrift and well-being of a nation. Yet, in the face of these plain logical facts, the Brewers' Congress has year after year, declared that their business is beneficial to the country; and therefore, demand special protection for their trade, from our State and National Legislatures.

788. In their behalf, it may be said, their business does furnish some employment to masons, blacksmiths, etc., etc. The number of breweries and distilleries in 1870, was more than six thousand; while there were 22,573 flouring and grist mills. The masons, blacksmiths, carpenters, coopers, etc., employed in connection with flour and grist mills, will much more than over-balance the same classes

What is said of the production of cotton goods? (785-786). What is said of the Brewers' Congress? (787). What comparison is made of the Brewers' business? (788).

*These figures are based on the census returns of 1870, and for further particulars see "Our Wasted Resources," p. 91-102.

employed about breweries and distilleries. It is very certain that the 22,573 mills will employ more of the labor of blacksmiths, carpenters, masons, etc., than the 6,000 breweries and distilleries; and as for coopers, the 32,485,396 barrels needed for the flour, etc., would certainly give them as much, if not more employment than the 8,697,695 beer and whisky barrels.

789. Nor must we forget that there still remains of our drink bill $104,777,767, which will afford a livelihood to thousands of flour and bread-stuffs dealers, bakers, etc., which, if not quite so numerous as bottlers, and retailers, dependent upon the brewer's business, they are far more useful. The Nation can well afford to dispense with all the unproductive laborers employed in the manufacture and the sale of intoxicating drinks.

LESSON FORTY-SIXTH.

LOSS BY DESTRUCTION OF FOOD. LOSS OF TIME, ETC.

790. The cost of alcoholic drinks is one thing, the loss from their use is another, and perhaps greater. Let us endeavor to approximately ascertain some of these losses. The waste of food materials in the production of alcoholic drinks, is no small drawback upon the prosperity of our country.

791. "Waste not, want not," is as applicable to *nations* as to *families* or individuals; and the other adage, "Wilful waste makes woeful want," will as surely be verified in the case of a nation's extravagance as a family. A family or nation may for a time, seem to escape this penalty, but sooner or later, they must reap what they sow, and suffer for their extravagance. The grain, etc., destroyed in producing alcoholic drinks from 1800 to 1860, equaled about 943,049,025 bushels.

792. There was manufactured in 1860, 88,002,989 gallons of spirits, 3,239,545 barrels of beer. To allow one bushel of grain for three gallons of spirits, and three

What remarks are made? (789). What is said of the waste caused by alcohol? (790). How much grain is destroyed? (791-792-793).

bushels for a barrel of beer; there was consumed for spirits, 29,334,326 bushels; for beer, 9,718,635 bushels, or a total of 39,052,961 bushels in 1860. The frauds on the Government, and other causes since 1860, make it difficult, if not impossible, to ascertain the amount of grain consumed; but we may safely assume that the grain consumed in the nine years from 1860 to 1869, was not less annually on an average, than in 1860; or 264,088,934 bushels for spirits. For malt liquors from 1860 to 1863 inclusive, 31,423,988 bushels; from 1864 to 1869 inclusive 366,449,887 bushels; and for 1869, 38,399,146 bushels.

793. From 1870 to 1879 inclusive, for spirits and malt liquors, there were consumed 282,796,648 bushels of grain; and the total waste of food from 1800 to 1875 inclusive, was not less than 1,630,694,706 bushels.

794. The value of this grain at 50 cents a bushel, would be $815,347,353. Who can comprehend this vast waste or destruction of food material. Allowing five bushels to make a barrel, the grain thus wasted would be equal to 326,156,941 barrels of meal; if ten barrels be placed on a wagon, allowing eight yards for each, they would extend over 148,442 miles, or nearly six times around the earth; or once around the earth, and then more than half way to the moon.

795. From 1870 to 1876, there was destroyed on an average annually, 47,132,774 bushels of grain, which would make 706,991,610 four-pound loaves of bread, or ninety-two loaves for every family in the United States in 1870.

796. It is a sin, and a crime to destroy the food of millions, even though enough may remain to keep them from starving. Every bushel of grain destroyed or made into liquor, increases the price of the remainder. Dear bread always causes bad trade. When bread is dear our laboring classes have not money for clothing, etc., as it takes all their earnings to buy food. The history of all commercial and manufacturing nations, has established the principle: that cheap food conduces to general prosperity, and dear food the reverse. The results to the nation are the same, whether forty or fifty million bush-

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What was the value of this grain? (794). What comparison is made? (795). How much was destroyed from 1870-1876? (796).

els of grain are destroyed by grasshoppers, by rain or mildew; or after being safely harvested, are destroyed in breweries and distilleries.

797. Better far that the grain had rotted in the field than to have been made into alcoholic drinks. In that case we should not have the innumerable evils and burdens flowing directly and indirectly from their use. It is very evident, that if the grain was used for bread instead of being destroyed in breweries and distilleries, it would be vastly better for all classes. No nation can prosper long that allows such wicked and criminal waste of food.

LOSS OF TIME AND INDUSTRY.

798. Among the most serious losses caused by drink, is the loss of Time and Industry. In 1875, there were 5,348 licensed wholesale liquor dealers, and 644 wholesale malt liquor dealers, or 5,992 wholesalers of liquors. If not less than three persons are employed in each of these establishments, 17,976 are engaged in the wholesale liquor trade.

799. There were also 163,453 licensed retail liquor dealers, and 7,081 licensed retail dealers in malt liquors, or 170,534 retail liquor establishments. If two persons are employed in each, there are engaged in the retail liquor business, 341,068.

800. It is well known that there are a large number of unlicensed liquor shops; the number of which has been estimated to be equal to the licensed in many cities. Assuming there are only half the number of unlicensed as licensed, and two persons engaged in each, there are employed in the unlicensed retail liquor trade, 170,534. The total engaged in the liquor selling, 577,322. There were 4,608 distilleries, if five men are employed in each, there were 23,040 engaged in distilling.

801. The Brewers' Congress reported in 1873, that 3,566 were employed in malt-houses and 11,138 in breweries, to which may be added 10,000 persons employed in distilleries and breweries, as blacksmiths, coopers, teamsters, etc. The persons engaged in the manufacture and sale of

what are the effects of this waste of grain? (797). What is said of the loss of time, labor, etc.? (799-800). How many persons are there engaged in the liquor business? (801-802).

alcoholic drinks; in malt-houses, 3,566; in breweries, 11,-138; in distilleries, 23,040; variably employed, 10,000. Total engaged in manufacturing liquors, 47,744; total engaged in selling liquors, 529,578.

802. Society derives no benefit from the labor of these 577,322 persons, which is a direct loss. Labor devoted to liquor, is worse than unproductive, it is positively destructive. Those engaged in it, are worse than paupers, for they not only consume the product of other labor; but prevents production by making idlers, and hence are worse than idlers themselves. If each was engaged in some useful industry, at wages averaging yearly $500, it would add to the wealth of the nation, $238,661,000 a year. This is but a small portion of the annual loss by labor taken from productive industries by strong drink.

803. It is estimated that there are 600,000 drunkards. This is scarcely an exaggeration. If each of the licensed retailers have only four customers who are drunkards, there will be 682,136. If these drunkards lose but one-half their time by drinking, at this low estimate, will be equal to the loss of the labor of 300,000 persons, which at the rate of $500 a year, would equal $150,000,000. There are it is estimated, 1,500,000 occasional drunkards. If these occasional drunkards lose one day in a week by drinking, it will be a loss of $156,000,000 a year.

804. Loss of time and industry will be as follows:

Of 577,322 engaged in the liquor traffic	$288,661,000
Of 600,000 drunkards	150,000,000
Of 1,500,000 Tipplers, (males)	156,000,000
Total loss of time, etc	$594,661,000

This loss of nearly six hundred million dollars of industry in 1875, is certainly below the real loss. Persons employing large number of hands, have estimated the loss of industry by drink to be equal to the cost of liquors. Though we are unable to present the exact figures of these losses, we believe that the loss of industries from alcohol in the United States may be safely estimated at not less than six hundred million dollars per annum.

What is lost by their labor? (803). What is lost by drunkenness? (804)

LESSON FORTY-SEVENTH.

LOSS FROM SICKNESS, ETC., BY ALCOHOL.

805. That alcohol drinks produce disease we have given ample evidence; and also that the ratio of sickness and death is in proportion to the facilities of obtaining these drinks. It is estimated that nearly one-half of the sickness in the civilized world is caused directly or indirectly by alcohol in various forms,

806. In the city of New York, one death in 4,070 of the population, is caused by alcohol, which at the usual rate of one death for twenty-eight cases of sickness, would give for New York one case of sickness for every 145 of the population.

807. The ratio of sickness in country portions of the United States is one case of sickness in 700 of the population. If one-third of the people of the United States are in cities and large towns, there will be one case of sickness from alcohol, to 261 of the population in the United States.

808. But not to exaggerate, we will allow one case of sickness for every 350 of the population, which is, we are sure much below the real average; for if we base our calculations on the tables of Dr. Neison, and Dr. Carpenter, total abstinence would reduce the sickness and death rate one-half even among moderate drinkers. At the rate of one case of sicknes to 350 of the population from alcohol, we have 114,257 persons simultaneously sick in the United States from drink.

809. The cost of medical attendance and medicine, will not, on an average, be less than one dollar a day, for each person sick, or an annual cost of $41,703,805. The loss of time at $1.50 for each working man will be a loss of $53,472,276 a year; or a loss annually from sickness caused by alcohol, of $95,176,081.

810. These drinks not only predispose the users to sickness, but prevent the cure of disease, and hasten death;

What is said of the loss from sickness caused by alcohol? (805). What was the sick rate, etc., of New York? (806). What is said of the loss from sickness? (807-808). What of the cost of medical attendance, etc.? (809). What of the total loss from sickness? (810).

and thus deprives the nation of the labor of its citizens, afflicts with sorrow and suffering, the victims and their friends, and causes a loss to the whole nation. Hence there can be no greater violation of the *principles* of *political economy*, than the absurd policy that encourages the production and use of alcoholic drinks, that injure the health and shorten the lives of the citizens.

THE ANNUAL DIRECT AND INDIRECT COST, AND LOSS IN THE UNITED STATES FROM ALCOHOL.

811. We have seen the immense cost of alcoholic drinks during the past century. Though the direct loss is so large, it is safe to estimate that the indirect cost and loss is still larger. The annual direct and indirect cost or loss from the use of, and the traffic in alcoholic drinks in the United States, is not less than as follows:

Loss from insanity, idiocy, blindness and deaf mutes by intemperance	$13,000,000
Cost of paupers, $7,286,952, with loss of labor of able-bodied paupers, vagrants, etc	15,000,000
Cost of supporting prisoners	4,000,000
Loss of time and labor of prisoners by drink	10,000,000
Loss of grain destroyed in making liquors	38,000,000
Loss of time and labor of persons in drink trades	600,000,000
Loss of time and labor cost, of medicine from sickness	95,000,000
Loss to employers by loss of labor	10,000,000
Cost of police prosecution, court expenses, losses by jurors, witnesses, etc	15,000,000
Indirect cost and loss	$800,000,000
Direct cost of liquors	700,000,000
Annual cost and loss in the United States	$1,500,000,000

812. Though the above estimates are only approximations, it will be evident to every one at all acquainted with those subjects, that these estimates are below the true cost and loss in the United States annually from drink. Is it not a shame that a professed christian nation should sacrifice annually FIFTEEN HUNDRED MILLION DOLLARS for the production of vice, crime, demoralization, impoverishment, misery, disease and death.

What is the direct and indirect cost and loss from alcohol? (811). Give the general remarks? (812).

"These are thy fruits foul, monster alcohol!
Fell source of more than half the nation's ills.
The inmates of the prisons are thy work,
The scaffold points to thy prevailing power,
While midnight murders, thefts and suicides,
All swell thy fated catalogue of crimes."

These are but a few of the costs, losses, and results of the drink traffic; yet they show the enormous burdens caused by it. Its ruinous expenditure not only paralyses trade, but entails upon our people, taxation for the support of police, dependents and criminals. It leads our laboring classes to idleness and vice. It stands in the way of our nation's prosperity. It opposes the progress of our people to a higher moral and intellectual development, and antagonizes all those means and virtues which are essential to the maintenance and perpetuation of a republican government, and the attainment of a higher civilization, and growth of christian principles. Does it pay?

LESSON FORTY-EIGHTH.

THE LICENSE SYSTEM A FAILURE—REMEDY: TOTAL PROHIBITION.

813. Alcoholic drinks have afflicted the people of all civilized nations for centuries, and governments have tried various means of regulating the traffic in order to lessen their evils. After centuries of trial, the license system has proved unable to prevent these evils. What then is the remedy? Total abstinence has been advocated nearly fifty years, and yet the drink traffic has flourished; crime, poverty, and drunkenness still exists; hence, total abstinence is said to be a failure.

814. It is true, that some will drink, while the facilities are afforded to tempt their appetites; yet the self-imposed law of total abstinence cannot fail. It has never

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How has the liquor traffic been regarded? (813). What are the results of total abstinence? (814).

failed any who have faithfully practised its precepts, but has proved a joy and blessing to all. Christianity has been a failure to those who refuse to accept its blessings by complying with its requirements. Yet, christianity is not a failure. The immediate aim of total abstinent reformers has been to reform drunkards, and prevent the young from falling into their vices. But the license system has antagonized individual efforts at reformation by indorsing the traffic as a legitimate trade, and spreading temptations before them.

815. Governments have thus sinfully aided to tempt back those who sought to be reclaimed, while they have constantly aided in enlisting new recruits to swell the motley throng, marching to woe and degradation; attesting the fatal error of license as a governmental policy. To license evil is to compromise with sin. God makes no compromise with evil; and all attempts to tolerate and regulate evil by law, is not in accord with the *higher law*, but is a violation of justice, and therefore doomed to failure.

816. To license the drink traffic clearly violates all sound policy of government, and is a blunder so gross, that awakening intelligence cast it off as a barbarism inherited from the less enlightened past, and a crime without even a shadow of palliation. License is a total failure. The evil government sought to check by a license privilege granted to the few, has been increased.

817. The policy of a State generally reflects the wisdom of the people. Prohibition is in accord with Divine Law. God does not in His laws license evil, but rebukes its perpetrator by His un-escapable edicts, clearly seen in physical laws, and confirmed by Sacred Record. Science and Scripture, in relation to the use of alcoholic drinks, accord.

818. The only defense of the traffic is the statutes which allow the privilege. Repeal the laws that now protect it as a monopoly, and the common sense of our people will sweep it out of existence. The true intent and aim of law should be to protect the interests of society by proclaiming what is right, and prohibiting what is wrong. All criminal laws are prohibitory, and are the means by which society protects its rights and the rights of individuals.

What has been the effects of license? (815). How should the license system be regarded? (816). What is said of the license system? (817-818).

IS THE LIQUOR TRAFFIC A LEGITIMATE BUSINESS?

819. The only point in the question is: does the use of alcoholic drinks, and the traffic in them, injure society? We have already seen their nature and many of the evils resulting from them.

820. These facts show that society has no greater enemy to its health, peace, virtue, and prosperity. No fact is so clear in American history than that it was the aim of the great and good men in the establishment of the nationality of the United States, that it should be a government "by the people, and for the people, based upon the *eternal law of right*, "*to establish justice, ensure domestic tranquility, provide for the common defence, promote the general welfare, and secure the blessings of liberty to themselves and posterity.*"

821. The Constitution contains nothing that does not harmonize with these objects. Any law, National or State, not in harmony with these objects is unconstitutional, and any business (even if recognized by law), *that interferes with domestic tranquility*, the promotion of the general welfare, and the securing of the blessings of liberty, is an *illegitimate business*, and is *outlawed* by the Constitution and the *higher law.*

822. State laws, in relation to the drink-traffic, are based on the principle to regulate the traffic, and to raise a revenue from it. It is thus admitted to be an evil that requires to be regulated, that persons should not be allowed to engage in it without the authority of law, proving the right of a State to extend its power to entire prohibition by law; for the power that can grant license can also take it away, and the power that can restrain can suppress.

823. Law is not an arbitrary demand of a political party. "The primary and principal objects of law are rights and wrongs, and their precepts are to live honestly, to hurt no one, and to give every one his due."—Blackstone.

824. The true intent and aim of every law, therefore, should be to protect the interests of society by proclaiming what is right and what is wrong; protecting rights and prohibiting wrongs. Society, by so doing, protects its own rights, which are an aggregation of the rights of individuals.

Is the liquor traffic legitimate business? (819). What is shown to be the effects of alcohol? (820). What is said of the formation of United States? (821). What is said of State laws? (822). What is the nature and intention of law? (823-824).

825. The right of society to protect itself, no one will question, as self-protection is an inherent right in the organization of society. If this was not so, governments would be useless. On the basis *of this right of self-protection* laws are enacted, penalties fixed, courts instituted, etc.

826. We need not now argue the rightfulness or the constitutionality of prohibition, or laws prohibiting the sale of liquors in small quantities. Chief Justice Taney said: "If any State deems the retail and internal traffic of ardent spirits injurious to its citizens, and calculated to produce idleness, vice, debauchery, I see nothing in the Constitution of the United States to prevent it from regulating or restraining the traffic, or from prohibiting it altogether, if it thinks proper." (5 Howard, 577.)

827. Mr. Justice McLean said: "A license to sell any article, foreign or domestic, as a merchant, inn-keeper, or victualler, is a matter of policy or revenue within the power of the State. No person can introduce into a community malignant disease, or anything which contaminates its morals or endangers its safety." (5 Howard, 589.) If the foreign article be injurious to the health and morals of a community, a State may, in the exercise of that great and comprehensive police power, which lies at the foundation of its prosperity, prohibit the sale." (5 Howard, 592.) "No one can claim a license to retail spirits as a matter of right." (Ibid., 597.)

828. Justice Catron said: "If the State has the power to restrain by license to any extent, she has the discretionary power to judge of its limits, and may go to the length of prohibiting its sales altogether." (5 Howard, 611.) Justice Grier, Justice Daniel, and Justice Woodbury agreed with the above cited opinions.

THE REMEDY—PROHIBITION.

829. There is no question but that each State has the right to prohibit the sale of alcoholic drinks. The people may rightfully ask that this traffic shall be prohibited, as being within the province of righteous legislation. We have laws against counterfeiting, gaming, lotteries, and

What is the right of society? (825). What is said of the constitutionality of prohibition? (826-827-828). What is the duty and right of our people? (829).

drunkenness, and anything that may in any way endanger the health or morals of society. Hence, no man can pursue any calling or business, however profitable, that tends to produce injury to society.

830. Society having the *right to protect itself*, it is absurd and criminal to enact laws to protect evil that tends to work its own destruction. Society has no right to authorize or license an individual to do wrong, or to sell a special privilege to any set of men to injure their fellows. No man has a right to injure another in person or property, nor has society.

831. It is, therefore, self-evident, that to grant license for any traffic, or to allow the importation or manufacture of articles that injure individuals, either in their property, person, or morals, is unjust, unconstitutional, and a violation of the natural rights of persons. No law can make a wrong act right. Laws entitled to the *respect of good citizens* must protect the *natural rights of man*; for law is the principle of obligation, or the requirement of natural justice. Laws that authorize the manufacture and sale of alcoholic drinks as beverages, violate natural justice, the rights guaranteed by the Declaration of Independence: life, liberty, and the pursuit of happiness; hence, the traffic in alcoholic drinks should be made as illegal as it is immoral, unjust, and prejudicial to the best interests of the nation. Laws that protect wrong may command obedience, but not respect.

832. The liquor trade, from its attendant evils, like slavery, is repugnant to natural law, or natural justice, which binds all to "live honestly, to hurt no one, and to give every one his due;" if it exist at all, it must be established and protected by STATUTE LAW; and its only defence is the *statutes* that confer upon it the special, though unjust privileges. To license the drink trade violates God's *law*, or *natural justice*, and is opposed to every sound and rational policy of civilized and Christian governments. It is an insult to reason, and a disgrace to the civilization of the nineteenth century.

833. How can this great scourge of civilization be removed? For fifty years moral suasion has been used by

What has society the right to do, and what not? (830). What is said of the granting of license? (831). What is necessary to sustain the drink traffic and why? (832) How can the evils of the drink traffic be removed? (833).

temperance reformers, and their efforts have been constantly thwarted by the operations of the license system. The experience of these fifty years has taught them that something more is needed, that moral suasion must be supplemented by legal suasion, that *total prohibition* of the traffic is the only effective remedy.

834. Is prohibition right? As already seen, it is constitutional. If it is right to punish crime, or what is still better, to prevent it, prohibition is certainly right, for it will doubtlessly prevent crime, as it will close those schools of infamy and crime—the drink shops. Close the drink shops, and crime, pauperism, insanity, idiocy, sickness and death will be decreased, while the numerous other ills that afflict society will be comparatively unknown. General prosperity cannot exist, while the drink traffic swallows up the hardly-earned wages of our people; and men and women cannot be educated either in literature, morals, or religion, while they frequent the pesthouses and drunkeries of our land.

835. The remedy for these evils are in the hands of our people. The Christian and moral citizens of our State and Nation can remove them if they but *will* to do so, and back and enforce their *will* with their votes. They who do not do all in their power to remove the licensed drink-shops, are responsible for their existence; and when they witness, or suffer, which everyone must, the evil results from them, they can truly say: "It is *my will that these things shall be.*" If our statesmen really desire the good of the people, they will apply the only remedy for the hosts of evils following in the train of intemperance. The only remedy is *total abstinence for the individual, and total prohibition of the drink traffic for the State.*

836. Shall this remedy be applied? Our people can, and must answer. If they *will* to apply it, we shall have individual and national prosperity, attended by peace, virtue and happiness. If they will not apply it, we shall still have drunkenness, poverty, misery, crime, sickness and death, as the results of the use of alcohol. Christian men and women, lovers of our race and country, what will you do? You have the right! You have the power! Will you exert this power that our fair country may be delivered from this scourge, *this woe and shame of Christendom—the drink traffic.*